Fig.1

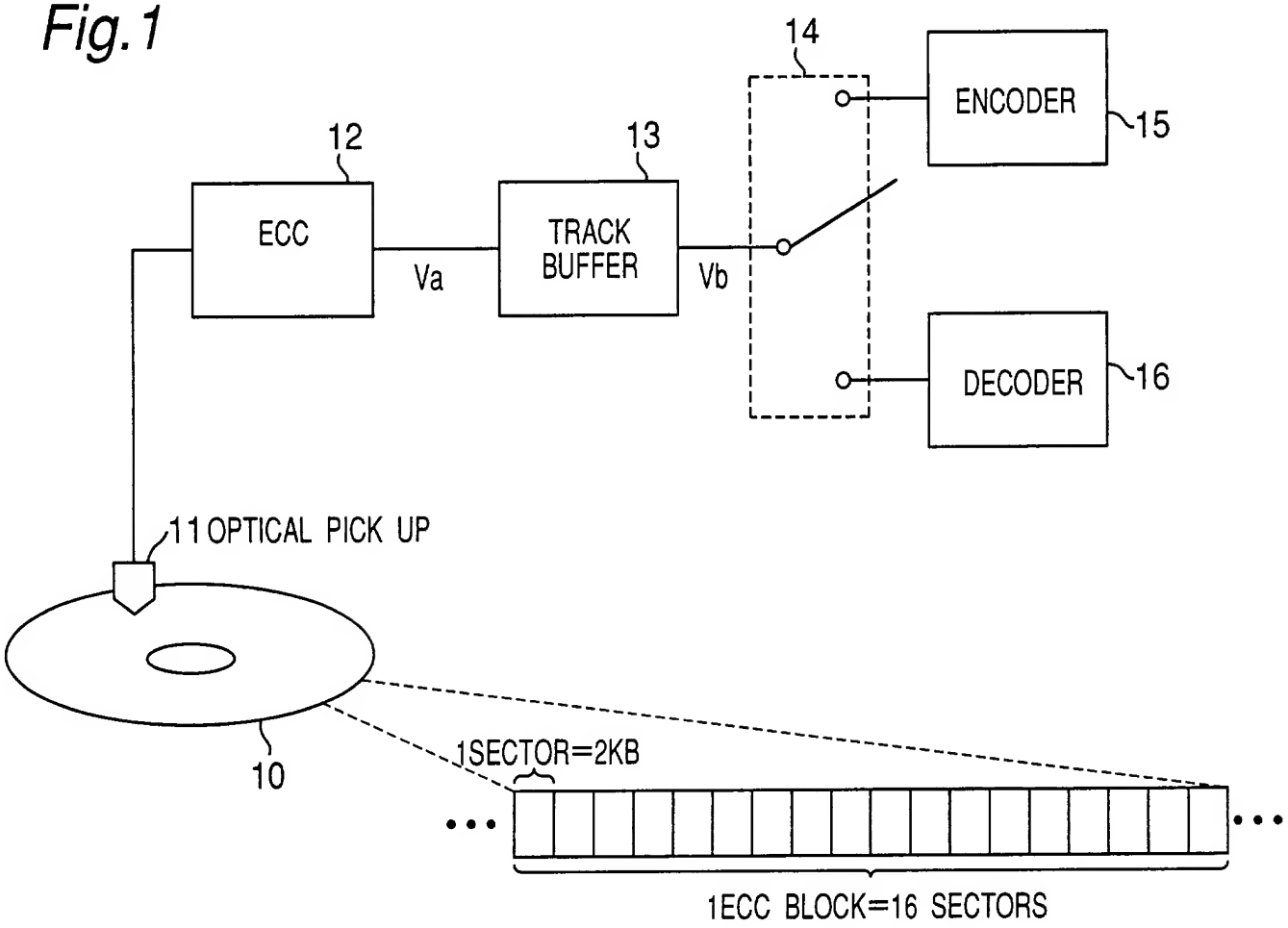

14
ENCODER
15
12
13
ECC
TRACK BUFFER
Va
Vb
DECODER
16
11 OPTICAL PICK UP
10
1SECTOR=2KB
1ECC BLOCK=16 SECTORS

Fig.2A

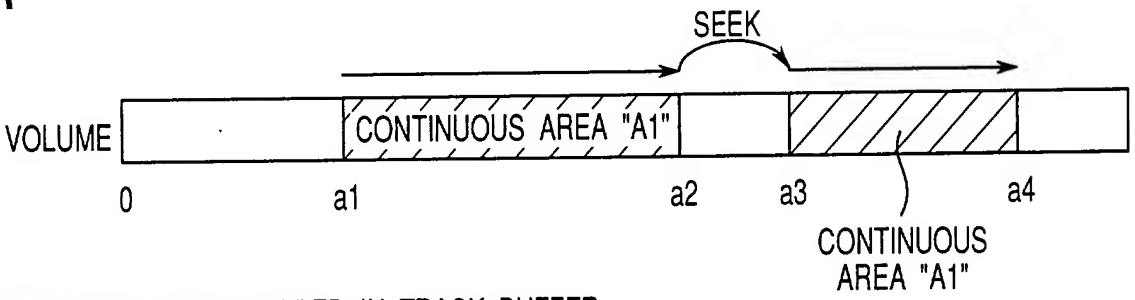

SEEK
VOLUME
CONTINUOUS AREA "A1"
0
a1
a2
a3
a4
CONTINUOUS
AREA "A1"

Fig.2B

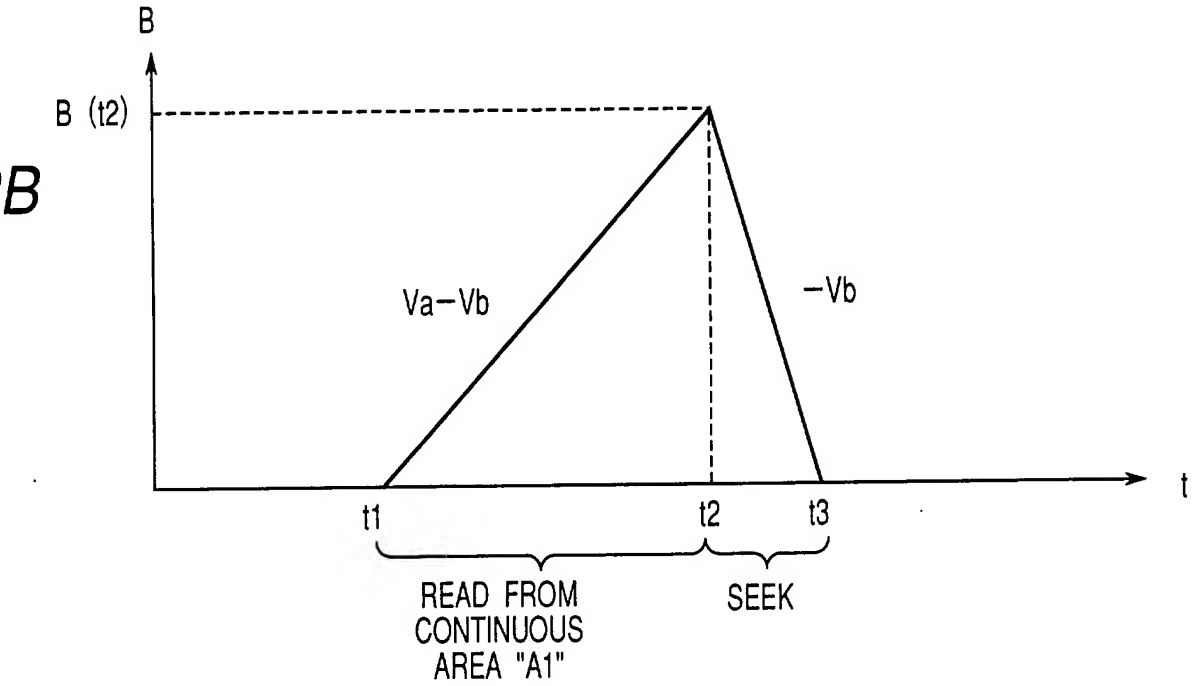

AMOUNT OF DATA STORED IN TRACK BUFFER
B
B (t2)
Va−Vb
−Vb
t
t1
t2
t3
READ FROM
CONTINUOUS
AREA "A1"
SEEK

Fig.3

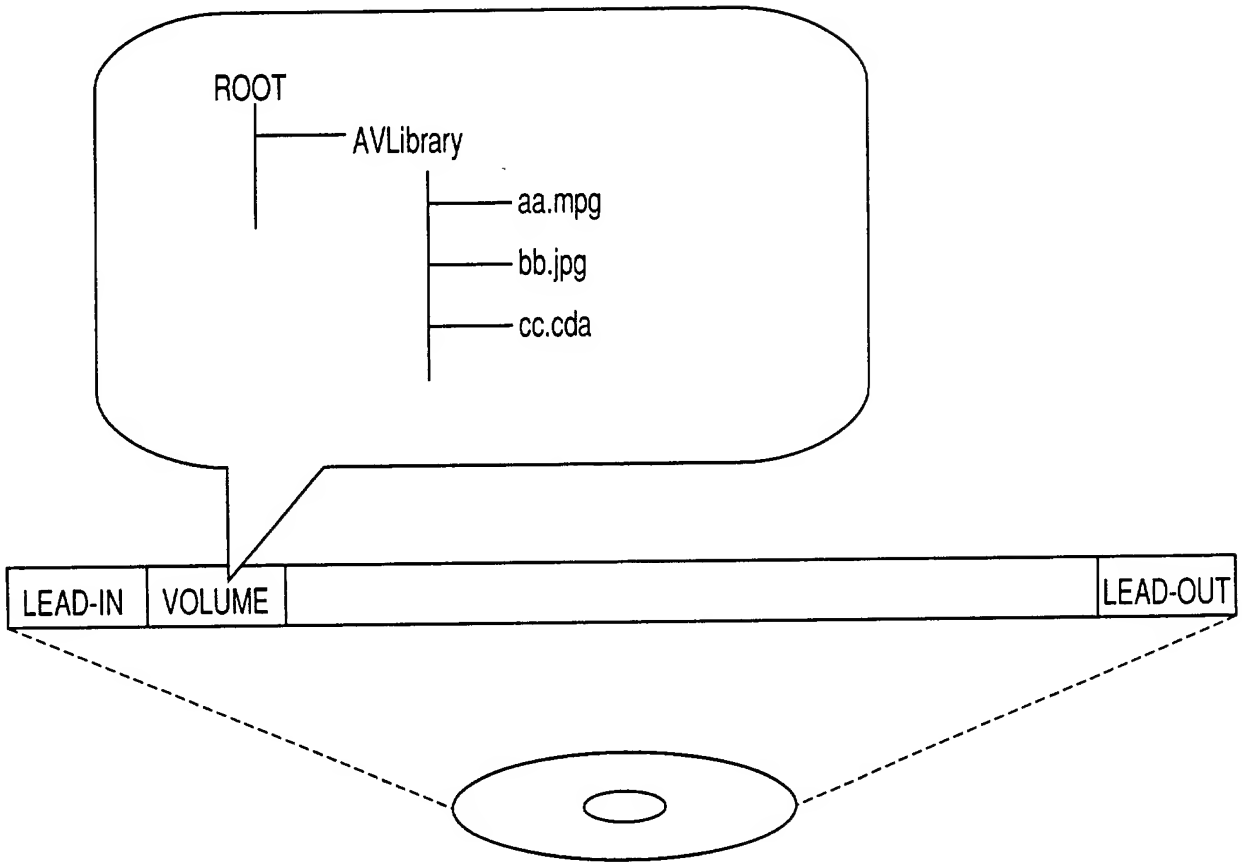


Fig.4

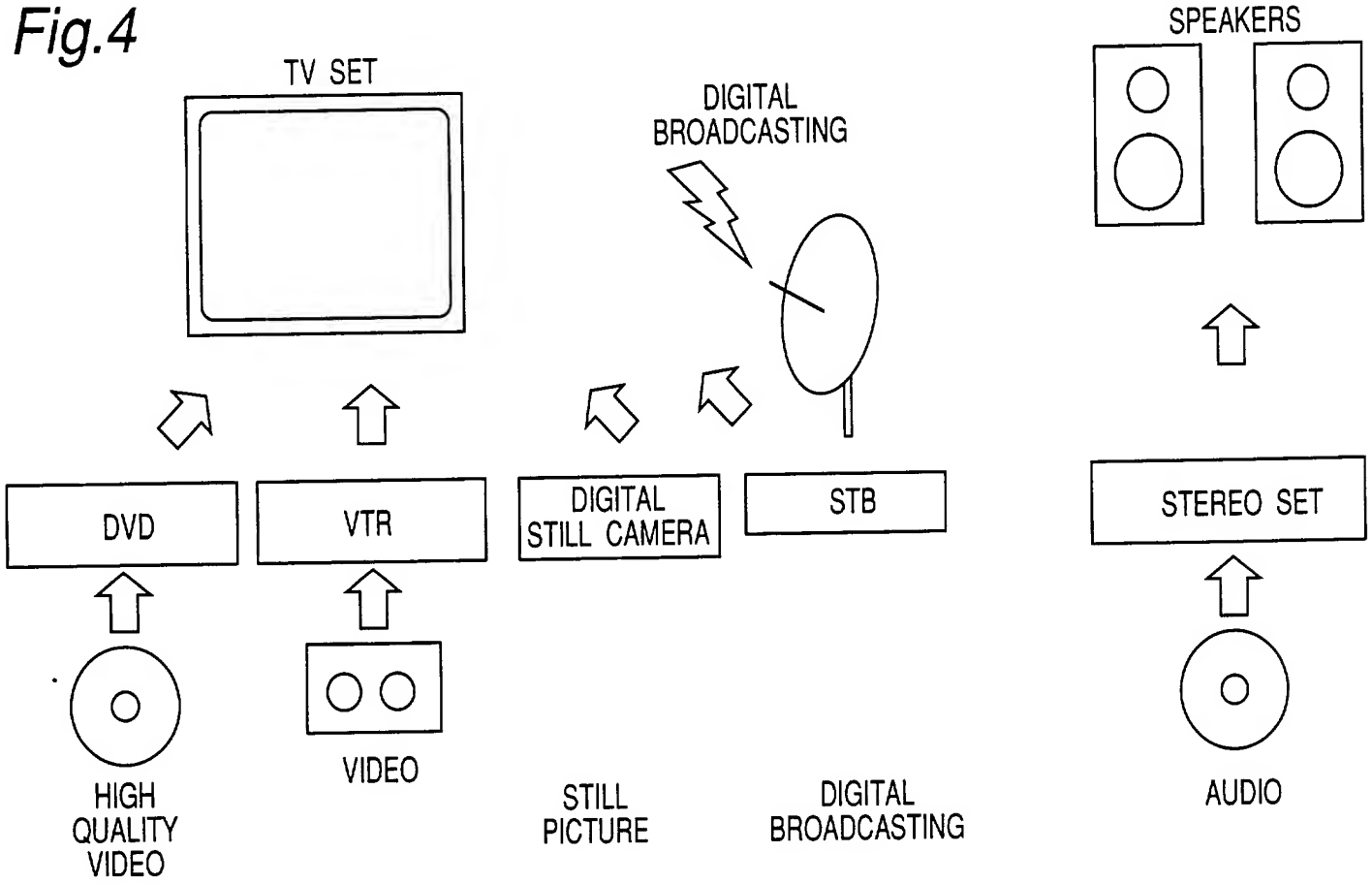

TV SET
DIGITAL BROADCASTING
SPEAKERS
DVD
VTR
DIGITAL STILL CAMERA
STB
STEREO SET
HIGH QUALITY VIDEO
VIDEO
STILL PICTURE
DIGITAL BROADCASTING
AUDIO

Fig.5

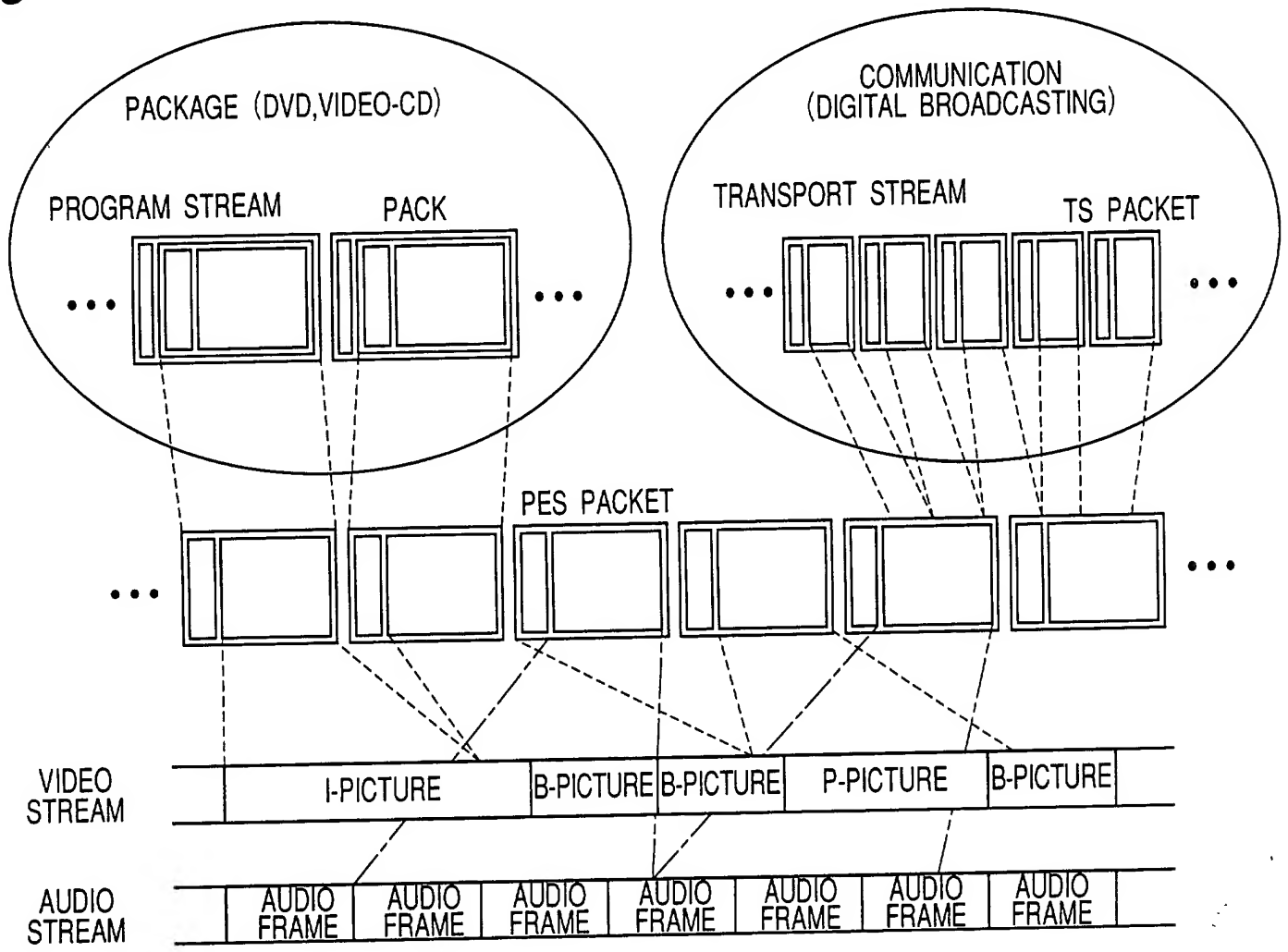

PACKAGE (DVD,VIDEO-CD)
PROGRAM STREAM
PACK
COMMUNICATION
(DIGITAL BROADCASTING)
TRANSPORT STREAM
TS PACKET
PES PACKET
VIDEO STREAM
I-PICTURE
B-PICTURE
B-PICTURE
P-PICTURE
B-PICTURE
AUDIO STREAM
AUDIO FRAME
AUDIO FRAME
AUDIO FRAME
AUDIO FRAME
AUDIO FRAME
AUDIO FRAME
AUDIO FRAME

Fig.6

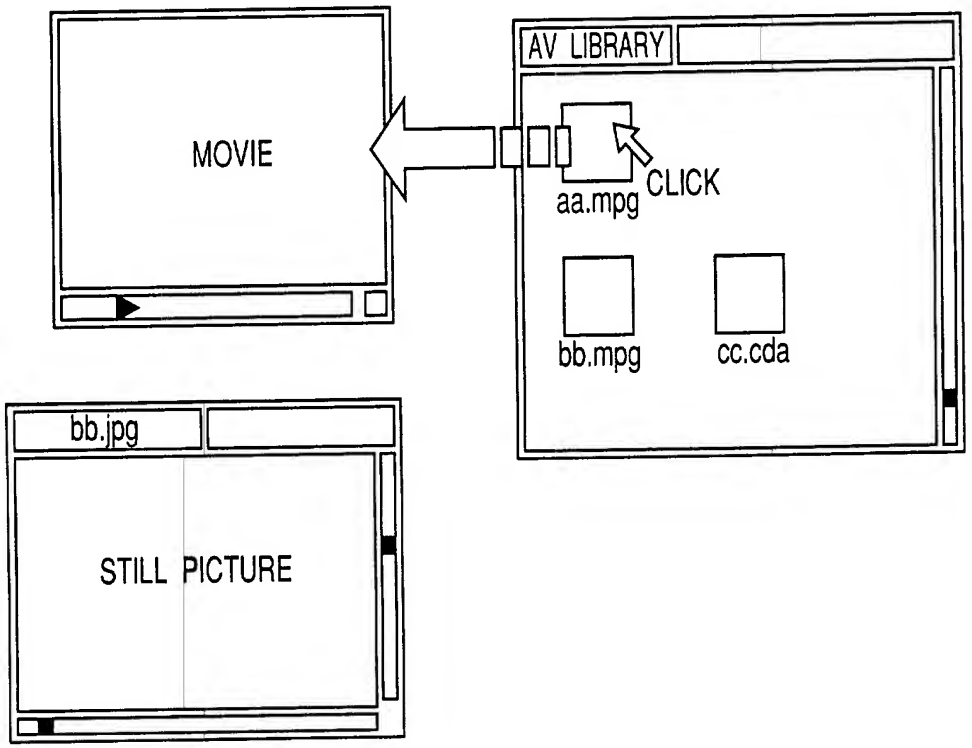

MOVIE
AV LIBRARY
aa.mpg
CLICK
bb.mpg
cc.cda
bb.jpg
STILL PICTURE

Fig.7

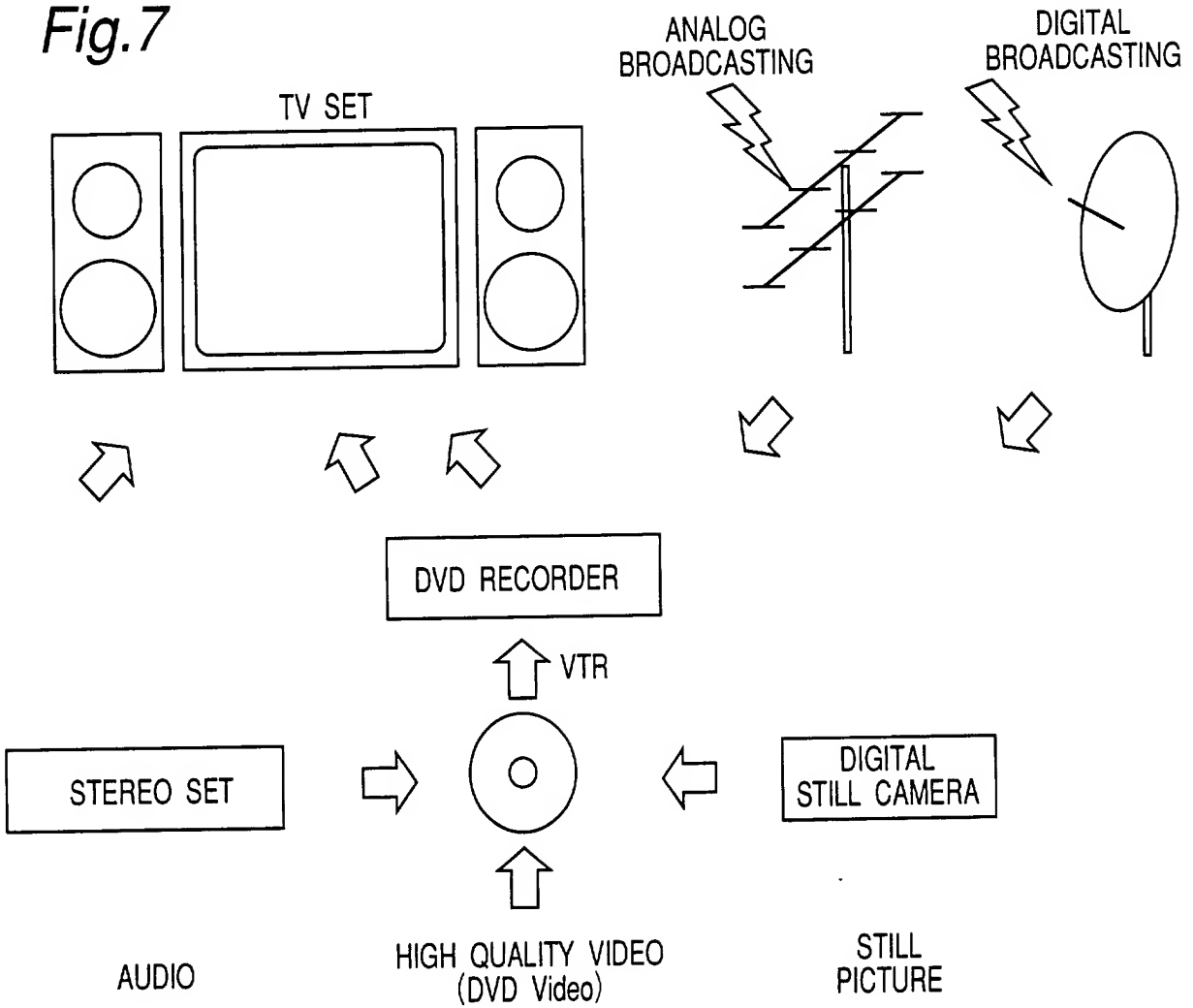
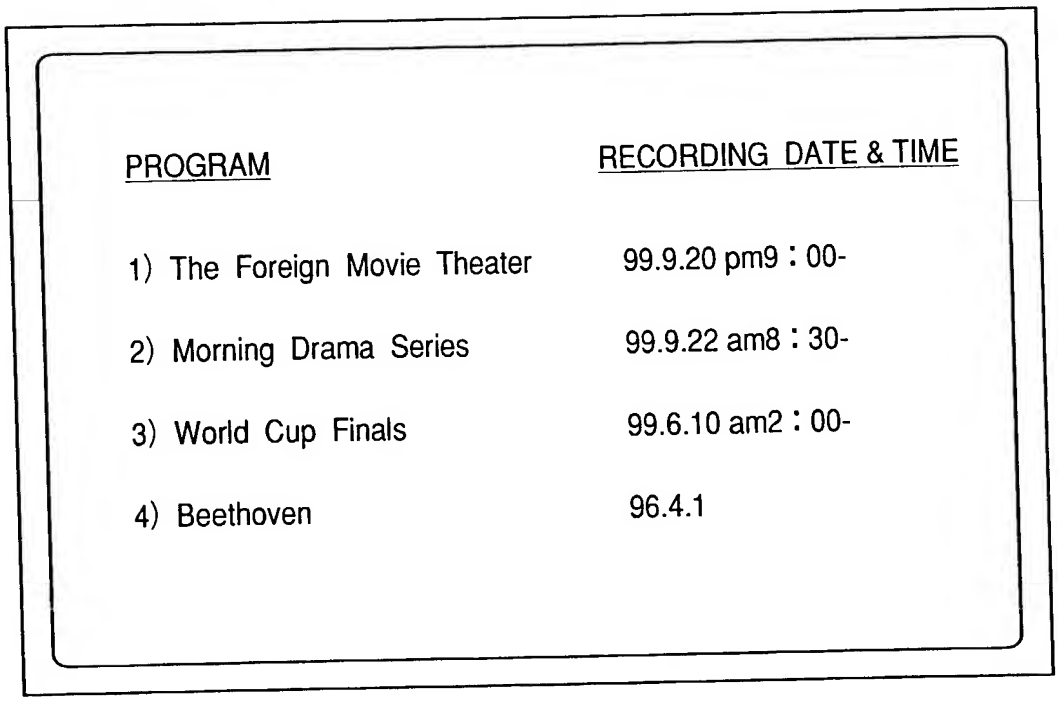

TV SET
ANALOG BROADCASTING
DIGITAL BROADCASTING
DVD RECORDER
VTR
STEREO SET
DIGITAL STILL CAMERA
AUDIO
HIGH QUALITY VIDEO (DVD Video)
STILL PICTURE

Fig.8



PROGRAM	RECORDING DATE & TIME
1) The Foreign Movie Theater	99.9.20 pm9 : 00-
2) Morning Drama Series	99.9.22 am8 : 30-
3) World Cup Finals	99.6.10 am2 : 00-
4) Beethoven	96.4.1

Fig.9A

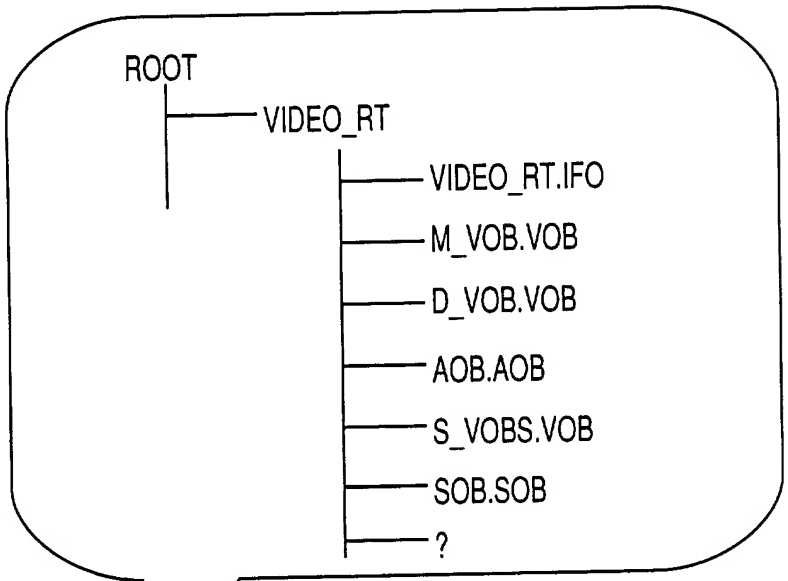

ROOT
VIDEO_RT
VIDEO_RT.IFO
M_VOB.VOB
D_VOB.VOB
AOB.AOB
S_VOBS.VOB
SOB.SOB
?

Fig.9B

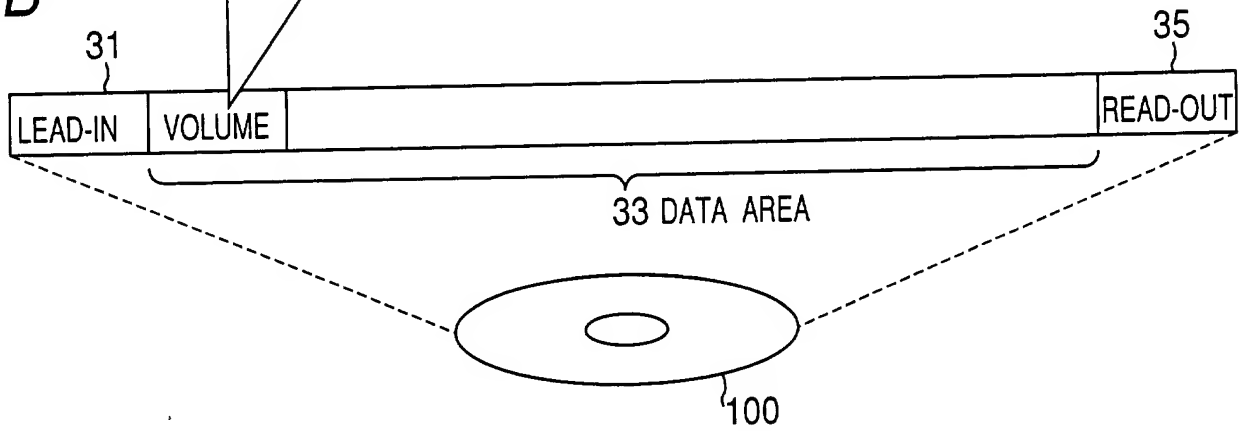

31
35
LEAD-IN
VOLUME
READ-OUT
33 DATA AREA
100

Fig.10

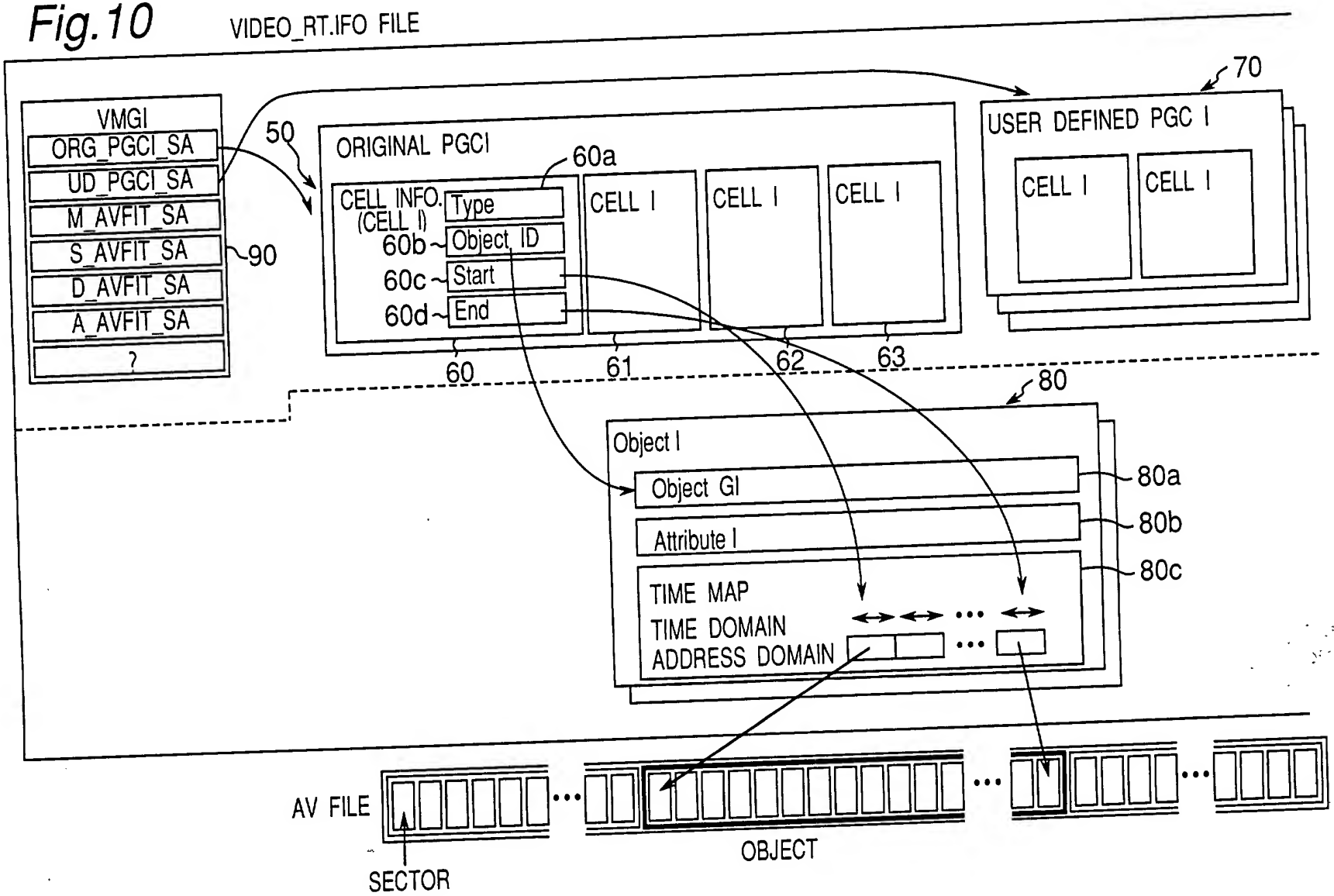
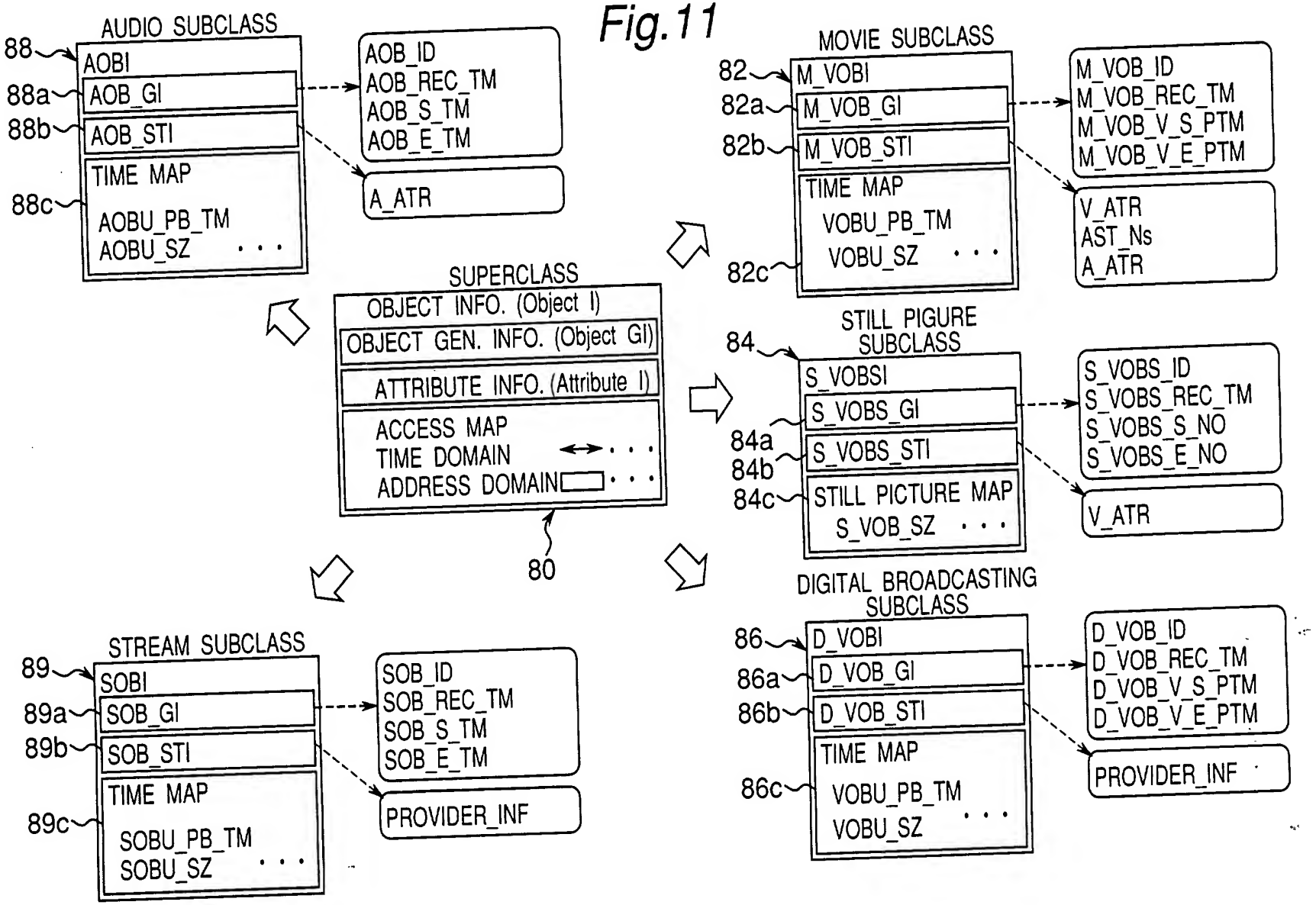

VIDEO_RT.IFO FILE
VMGI
ORG_PGCI_SA
UD_PGCI_SA
M_AVFIT_SA
S_AVFIT_SA
D_AVFIT_SA
A_AVFIT_SA
?
90
50
ORIGINAL PGCI
60a
CELL INFO. (CELL I)
Type
Object ID
Start
End
60b
60c
60d
CELL I
CELL I
CELL I
CELL I
60
61
62
63
70
USER DEFINED PGC I
CELL I
CELL I
80
Object I
Object GI
Attribute I
TIME MAP
TIME DOMAIN
ADDRESS DOMAIN
80a
80b
80c
AV FILE
SECTOR
OBJECT

Fig.11


AUDIO SUBCLASS
88
AOBI
88a
AOB_GI
88b
AOB_STI
TIME MAP
88c
AOBU_PB_TM
AOBU_SZ
AOB_ID
AOB_REC_TM
AOB_S_TM
AOB_E_TM
A_ATR
MOVIE SUBCLASS
82
M_VOBI
82a
M_VOB_GI
82b
M_VOB_STI
TIME MAP
VOBU_PB_TM
VOBU_SZ
82c
M_VOB_ID
M_VOB_REC_TM
M_VOB_V_S_PTM
M_VOB_V_E_PTM
V_ATR
AST_Ns
A_ATR
SUPERCLASS
OBJECT INFO. (Object I)
OBJECT GEN. INFO. (Object GI)
ATTRIBUTE INFO. (Attribute I)
ACCESS MAP
TIME DOMAIN
ADDRESS DOMAIN
80
STILL PIGURE SUBCLASS
84
S_VOBSI
S_VOBS_GI
84a
S_VOBS_STI
84b
STILL PICTURE MAP
S_VOB_SZ
84c
S_VOBS_ID
S_VOBS_REC_TM
S_VOBS_S_NO
S_VOBS_E_NO
V_ATR
STREAM SUBCLASS
89
SOBI
89a
SOB_GI
89b
SOB_STI
TIME MAP
89c
SOBU_PB_TM
SOBU_SZ
SOB_ID
SOB_REC_TM
SOB_S_TM
SOB_E_TM
PROVIDER_INF
DIGITAL BROADCASTING SUBCLASS
86
D_VOBI
86a
D_VOB_GI
86b
D_VOB_STI
TIME MAP
86c
VOBU_PB_TM
VOBU_SZ
D_VOB_ID
D_VOB_REC_TM
D_VOB_V_S_PTM
D_VOB_V_E_PTM
PROVIDER_INF

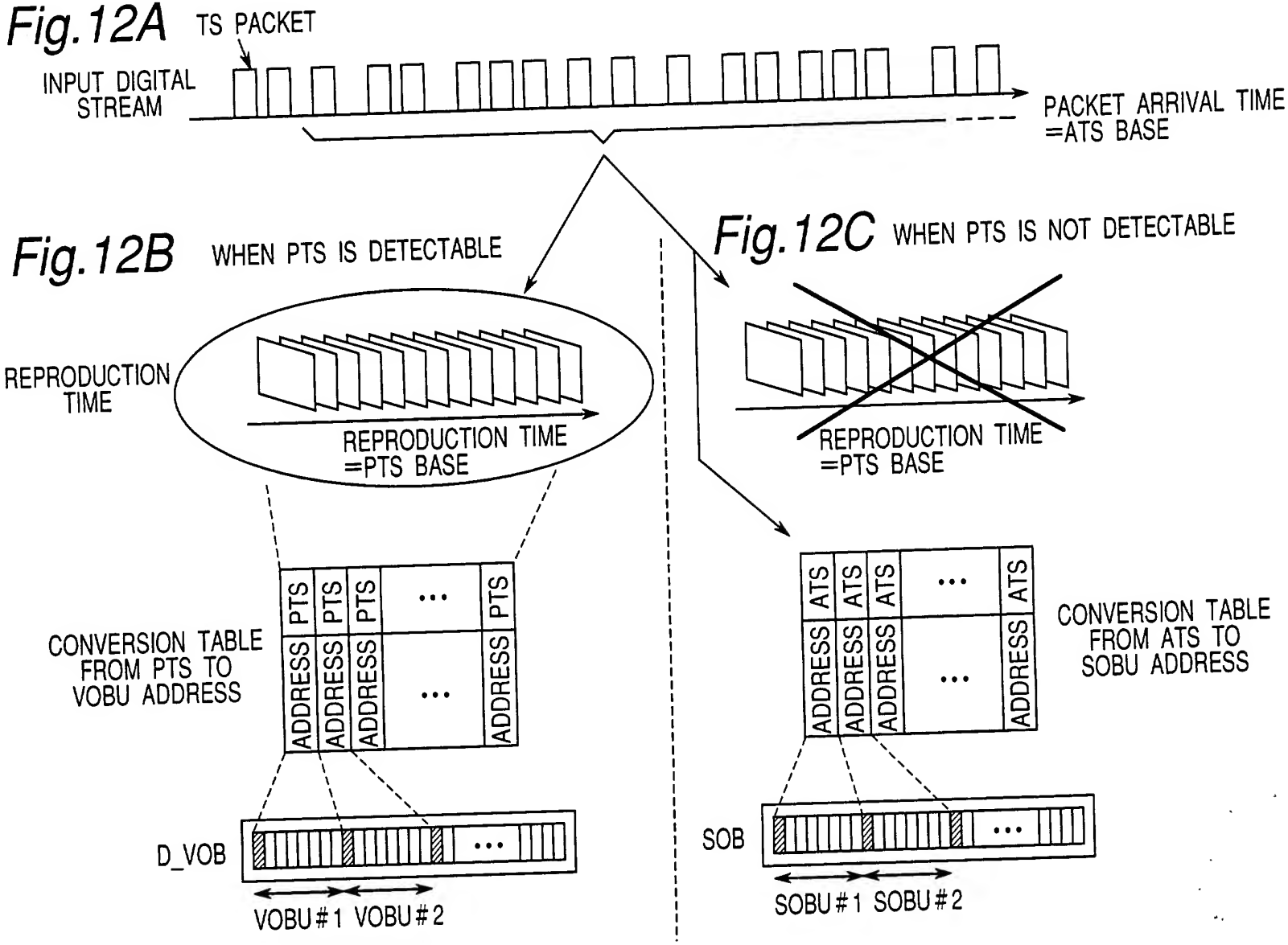


Fig.12A
TS PACKET
INPUT DIGITAL STREAM
PACKET ARRIVAL TIME =ATS BASE
Fig.12B
WHEN PTS IS DETECTABLE
REPRODUCTION TIME
REPRODUCTION TIME =PTS BASE
CONVERSION TABLE FROM PTS TO VOBU ADDRESS
PTS
ADDRESS
D_VOB
VOBU#1 VOBU#2
Fig.12C
WHEN PTS IS NOT DETECTABLE
REPRODUCTION TIME =PTS BASE
CONVERSION TABLE FROM ATS TO SOBU ADDRESS
ATS
ADDRESS
SOB
SOBU#1 SOBU#2

Fig.13A

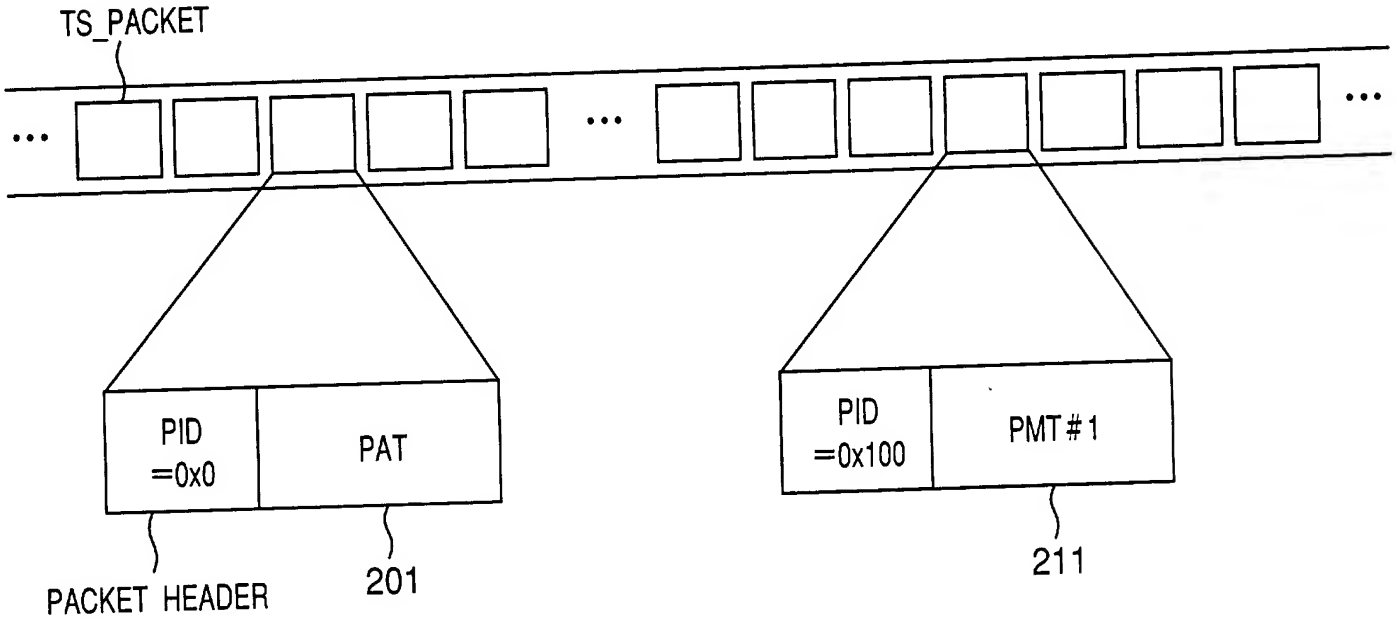


Fig.13B

ProgramID	PMT_PID
#1	0x100
:	:

201 PAT

Fig.13C

ES_PID	Stream_type
0x101	ISO / IEC11172 - 2 Video
0x102	ISO / IEC11172 - 3 Audio
:	:

211 PMT

Fig.14

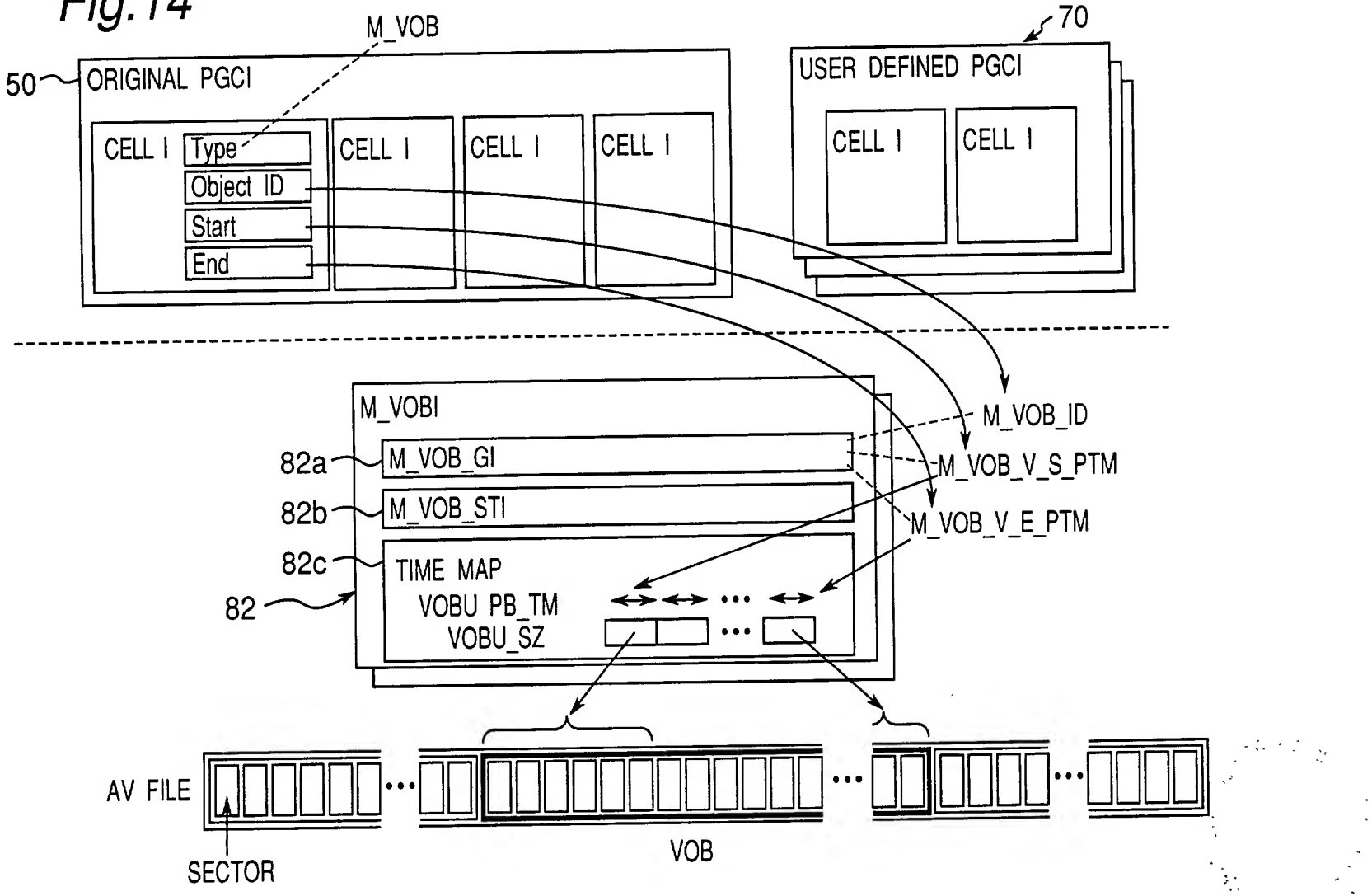

M_VOB
50
ORIGINAL PGCI
CELL I
Type
Object ID
Start
End
CELL I
CELL I
CELL I
70
USER DEFINED PGCI
CELL I
CELL I
M_VOBI
82a
M_VOB_GI
82b
M_VOB_STI
82c
TIME MAP
VOBU PB_TM
VOBU_SZ
82
M_VOB_ID
M_VOB_V_S_PTM
M_VOB_V_E_PTM
AV FILE
SECTOR
VOB

Fig.15A

Fig.15B

Fig.15C

Fig.15D

Fig.15E

Fig.15F

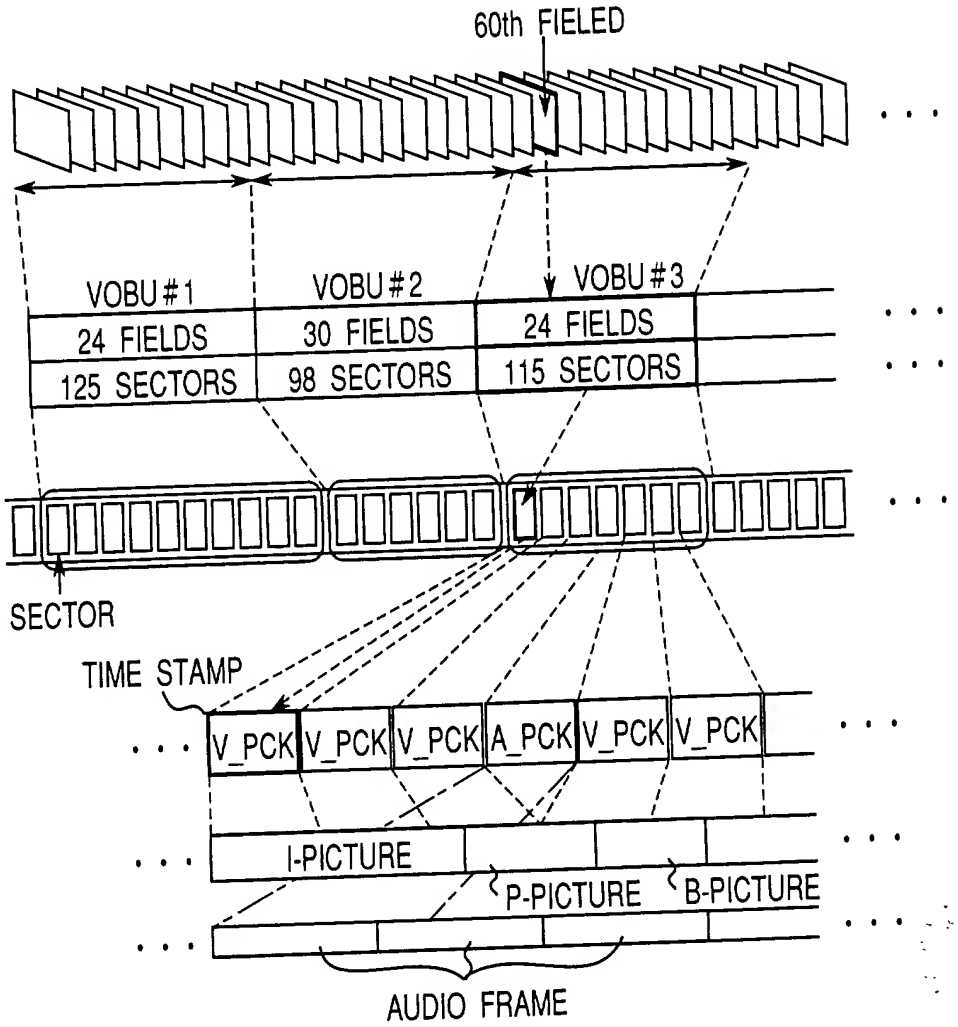


Fig.16A

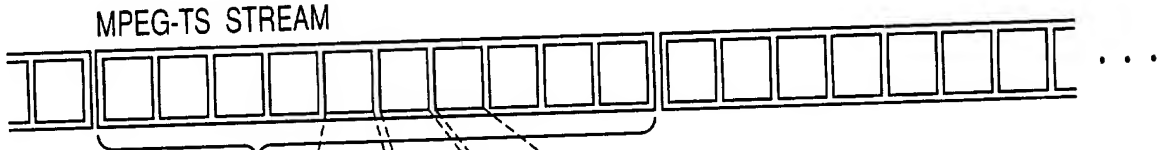


Fig.16B

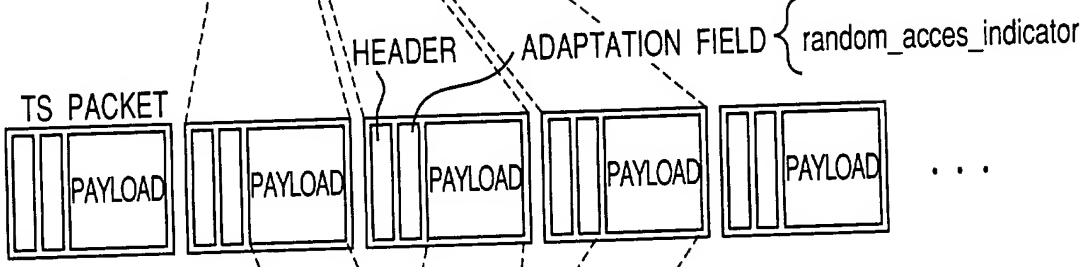


Fig.16C

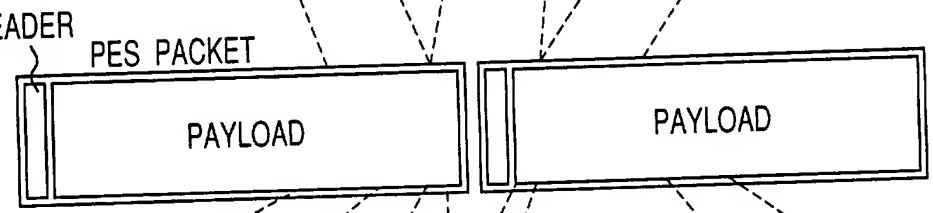


Fig.16D

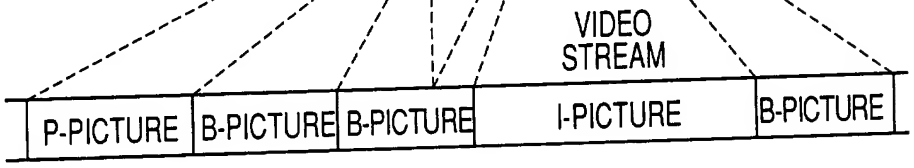


Fig.17

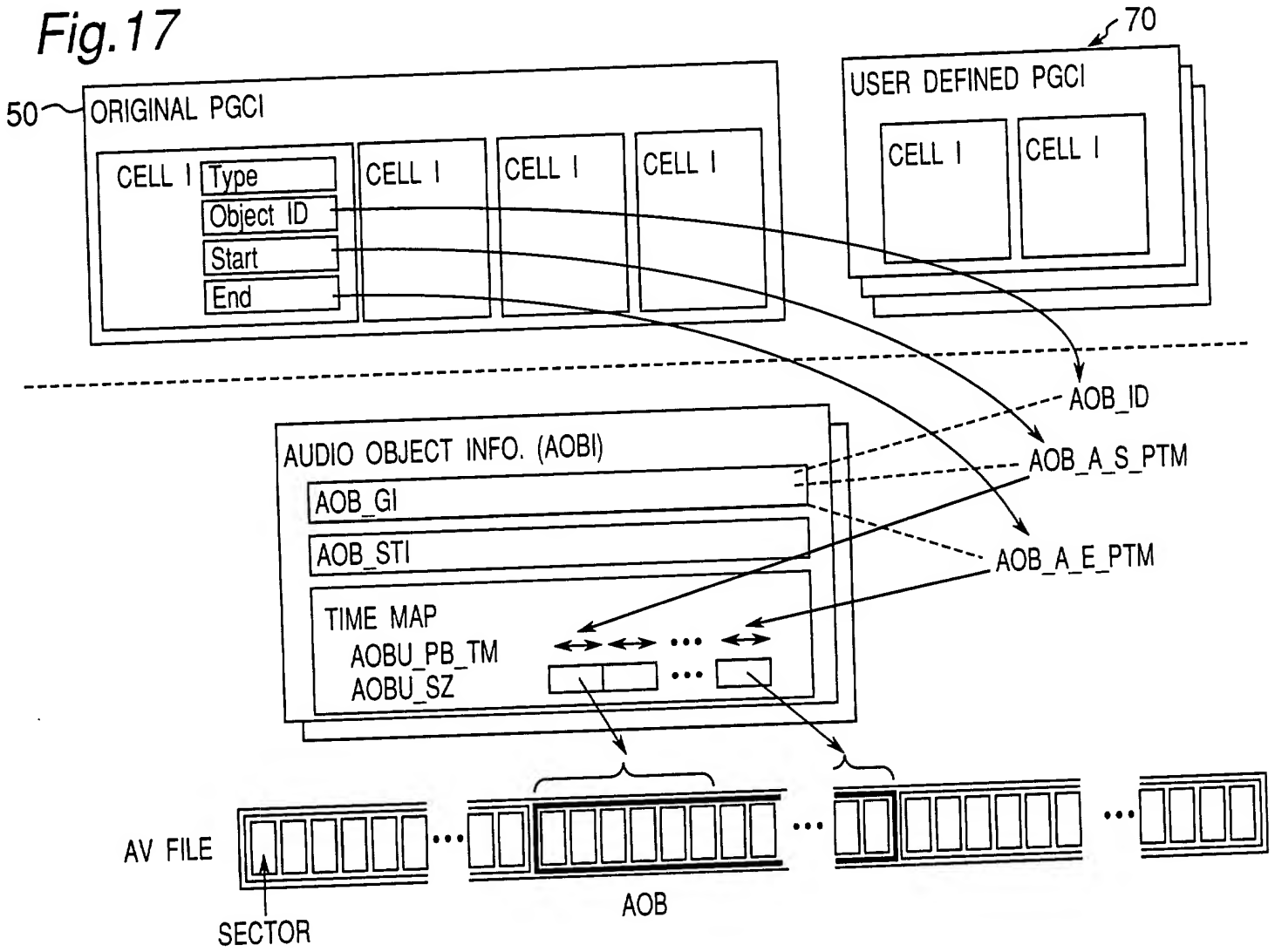

50
ORIGINAL PGCI
CELL I
Type
Object ID
Start
End
CELL I
CELL I
CELL I
70
USER DEFINED PGCI
CELL I
CELL I
AOB_ID
AOB_A_S_PTM
AOB_A_E_PTM
AUDIO OBJECT INFO. (AOBI)
AOB_GI
AOB_STI
TIME MAP
AOBU_PB_TM
AOBU_SZ
AV FILE
SECTOR
AOB

Fig.18

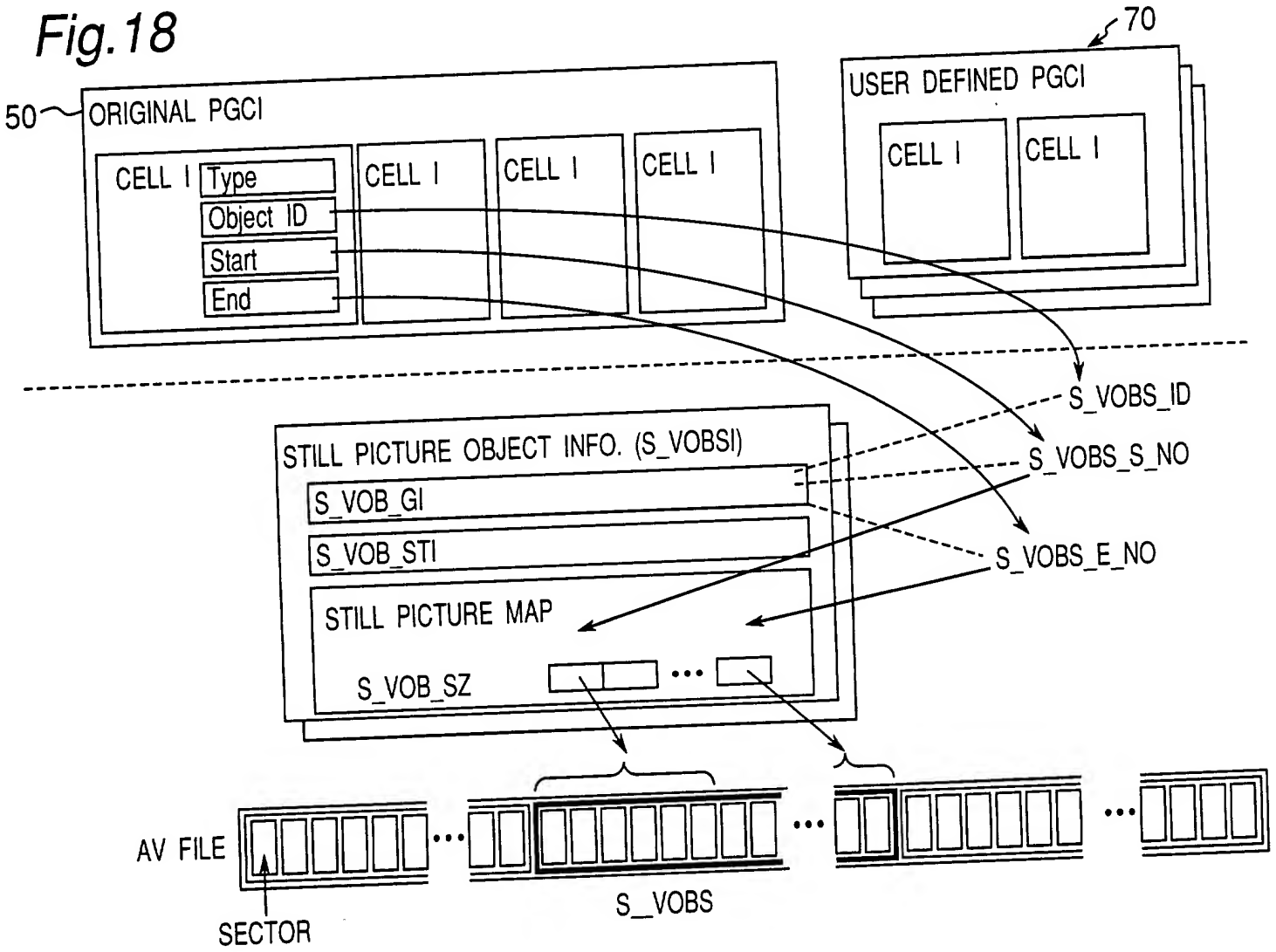

70
50
ORIGINAL PGCI
CELL I
Type
Object ID
Start
End
CELL I
CELL I
CELL I
USER DEFINED PGCI
CELL I
CELL I
S_VOBS_ID
S_VOBS_S_NO
S_VOBS_E_NO
STILL PICTURE OBJECT INFO. (S_VOBSI)
S_VOB_GI
S_VOB_STI
STILL PICTURE MAP
S_VOB_SZ
AV FILE
SECTOR
S_VOBS

Fig.19

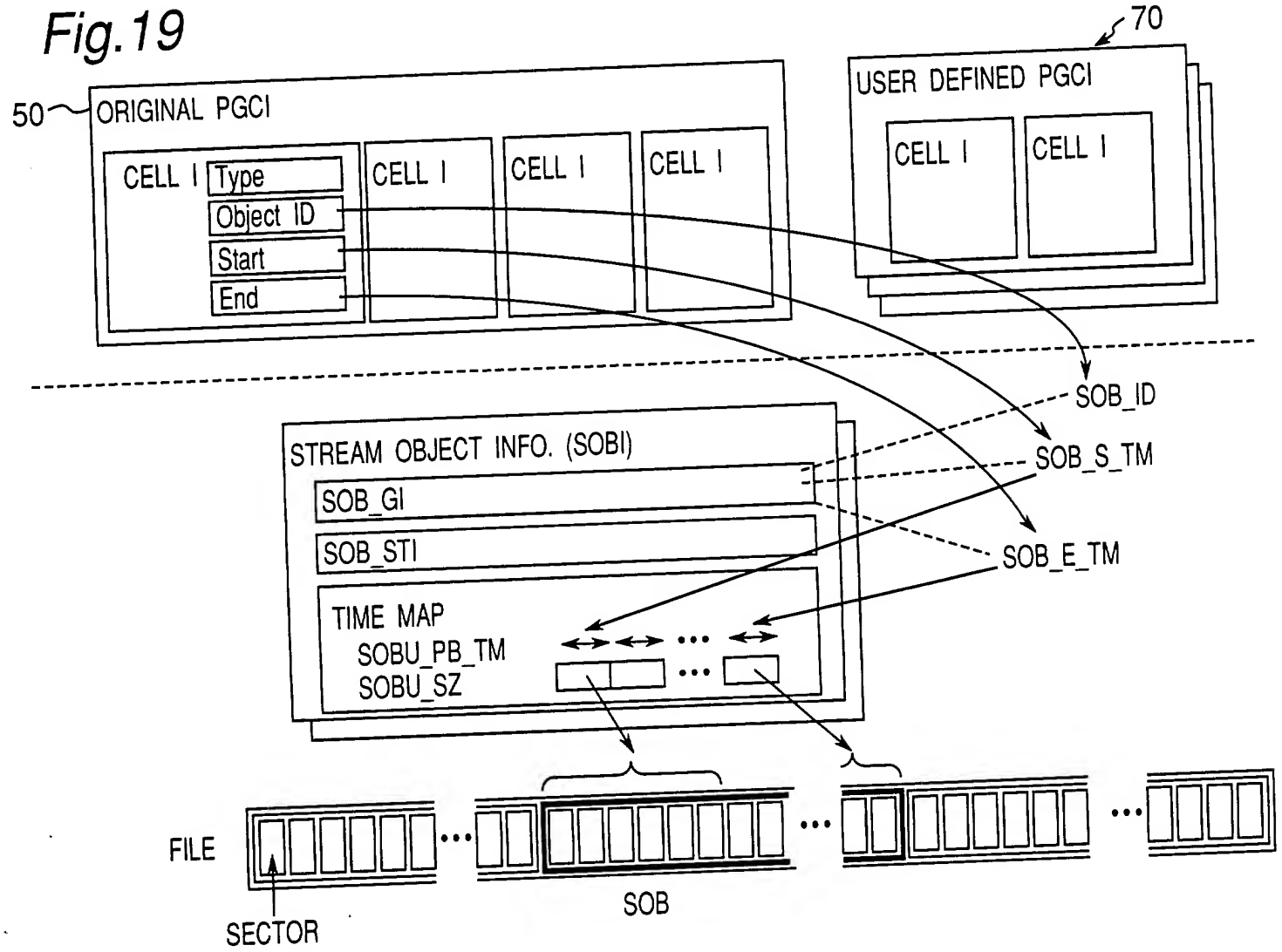

50
ORIGINAL PGCI
CELL I
Type
Object ID
Start
End
CELL I
CELL I
CELL I
70
USER DEFINED PGCI
CELL I
CELL I
SOB_ID
SOB_S_TM
SOB_E_TM
STREAM OBJECT INFO. (SOBI)
SOB_GI
SOB_STI
TIME MAP
SOBU_PB_TM
SOBU_SZ
FILE
SECTOR
SOB

Fig.20

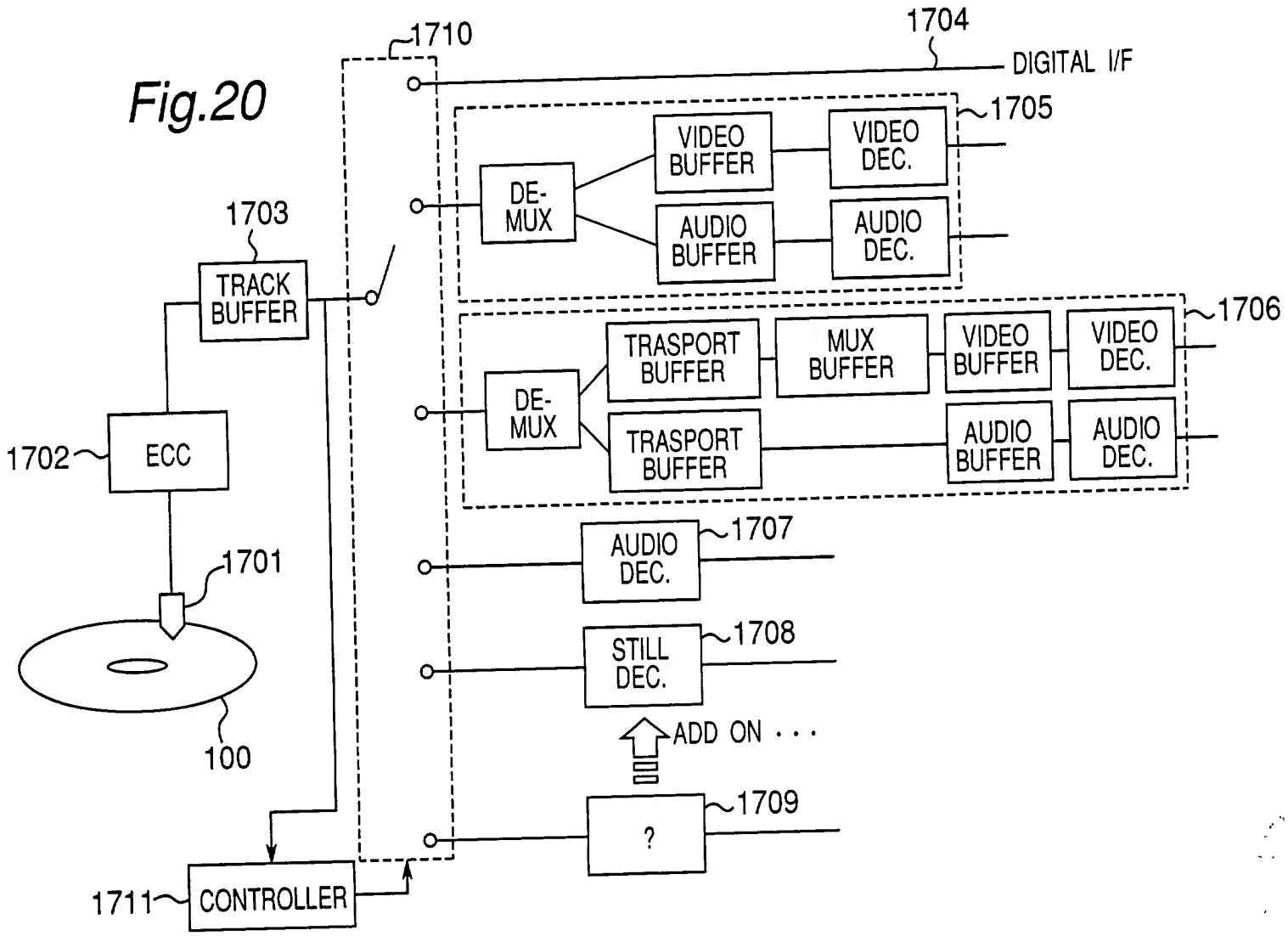

1710
1704
DIGITAL I/F
1705
VIDEO BUFFER
VIDEO DEC.
DE-MUX
AUDIO BUFFER
AUDIO DEC.
1703
TRACK BUFFER
1706
TRASPORT BUFFER
MUX BUFFER
VIDEO BUFFER
VIDEO DEC.
DE-MUX
TRASPORT BUFFER
AUDIO BUFFER
AUDIO DEC.
1702
ECC
1707
AUDIO DEC.
1701
1708
STILL DEC.
ADD ON · · ·
100
1709
?
1711
CONTROLLER

Fig.21

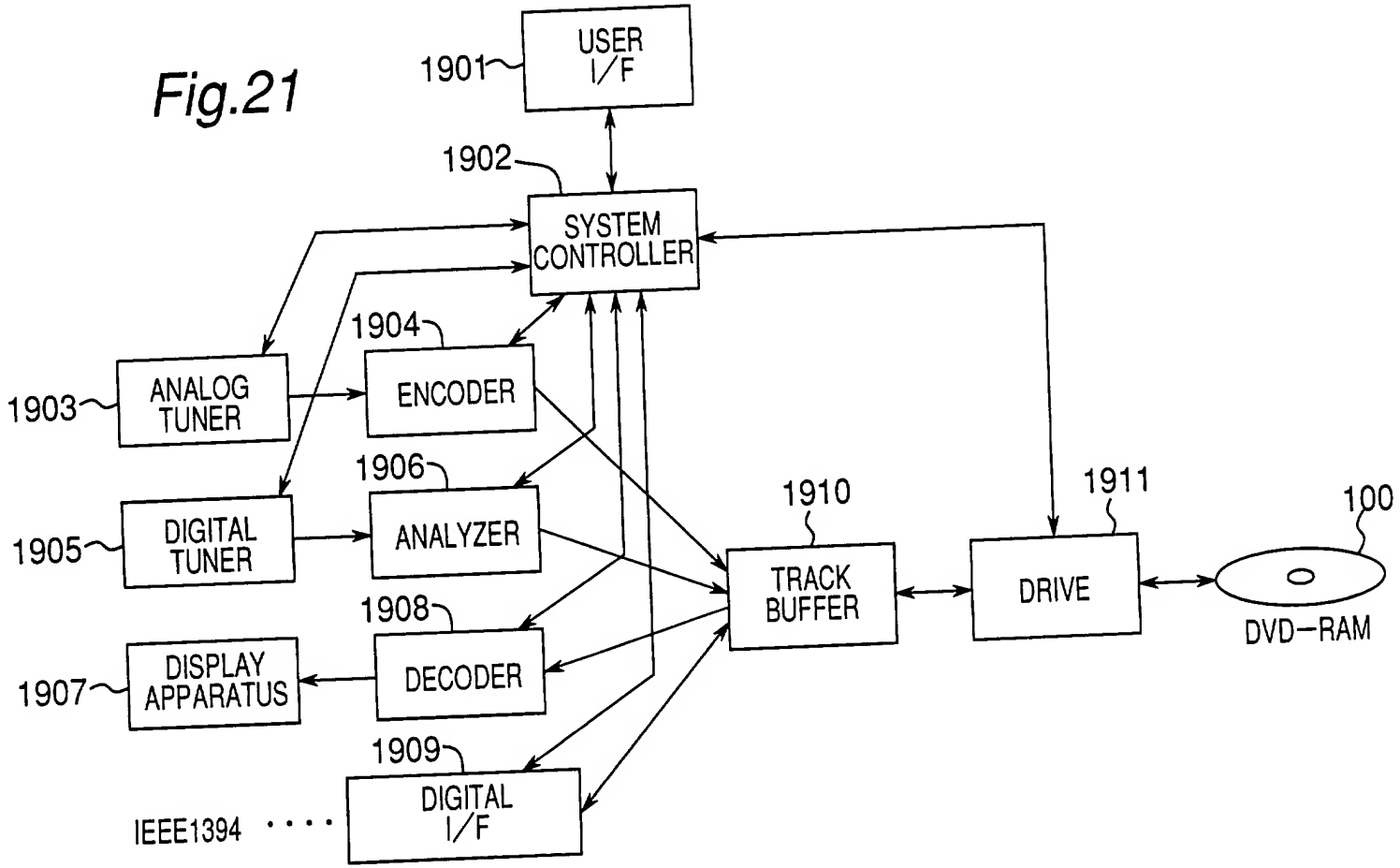

1901
USER I/F
1902
SYSTEM CONTROLLER
1904
ENCODER
1903
ANALOG TUNER
1906
ANALYZER
1905
DIGITAL TUNER
1908
DECODER
1907
DISPLAY APPARATUS
1909
DIGITAL I/F
IEEE1394
1910
TRACK BUFFER
1911
DRIVE
100
DVD−RAM

Fig.22

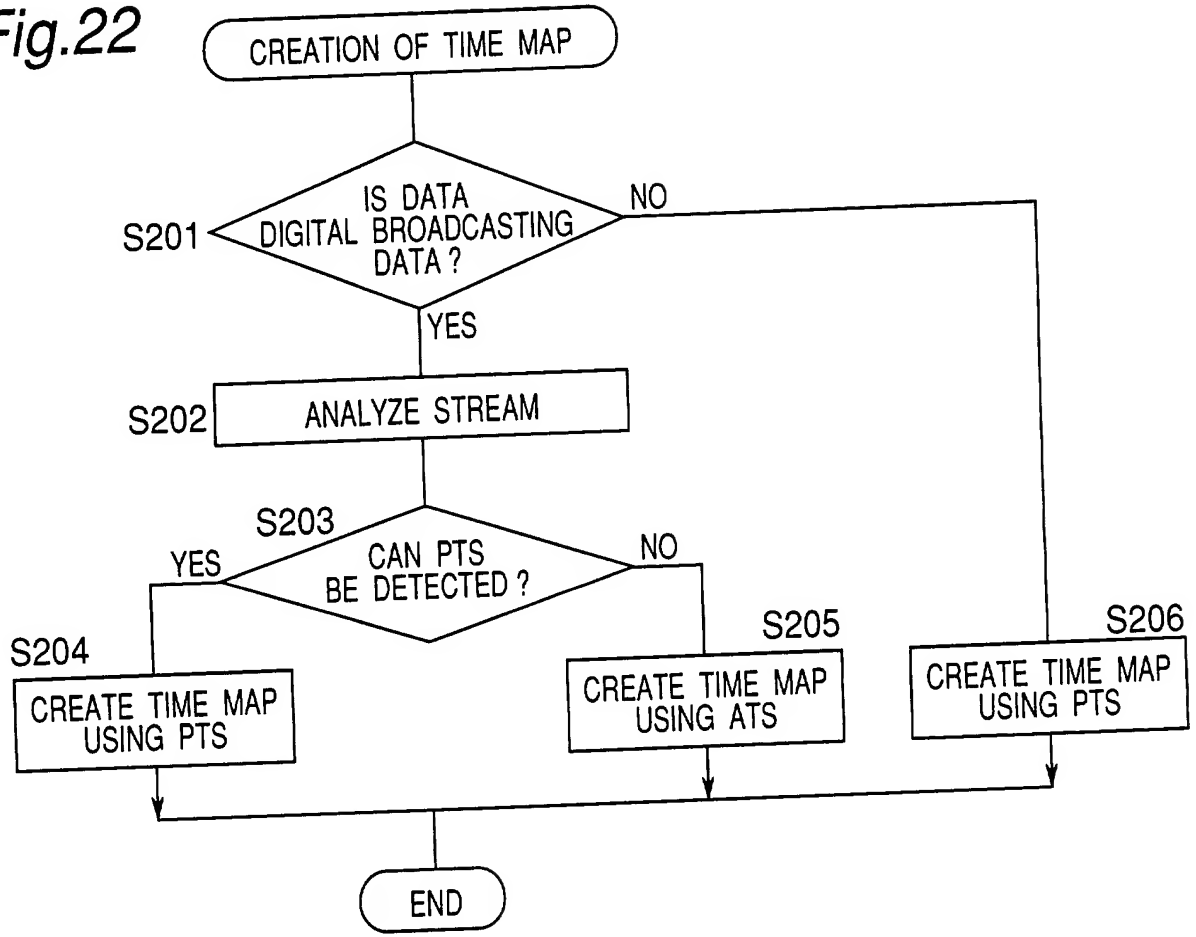

CREATION OF TIME MAP
S201
IS DATA DIGITAL BROADCASTING DATA ?
NO
YES
S202
ANALYZE STREAM
S203
CAN PTS BE DETECTED ?
YES
NO
S204
CREATE TIME MAP USING PTS
S205
CREATE TIME MAP USING ATS
S206
CREATE TIME MAP USING PTS
END

Fig.23

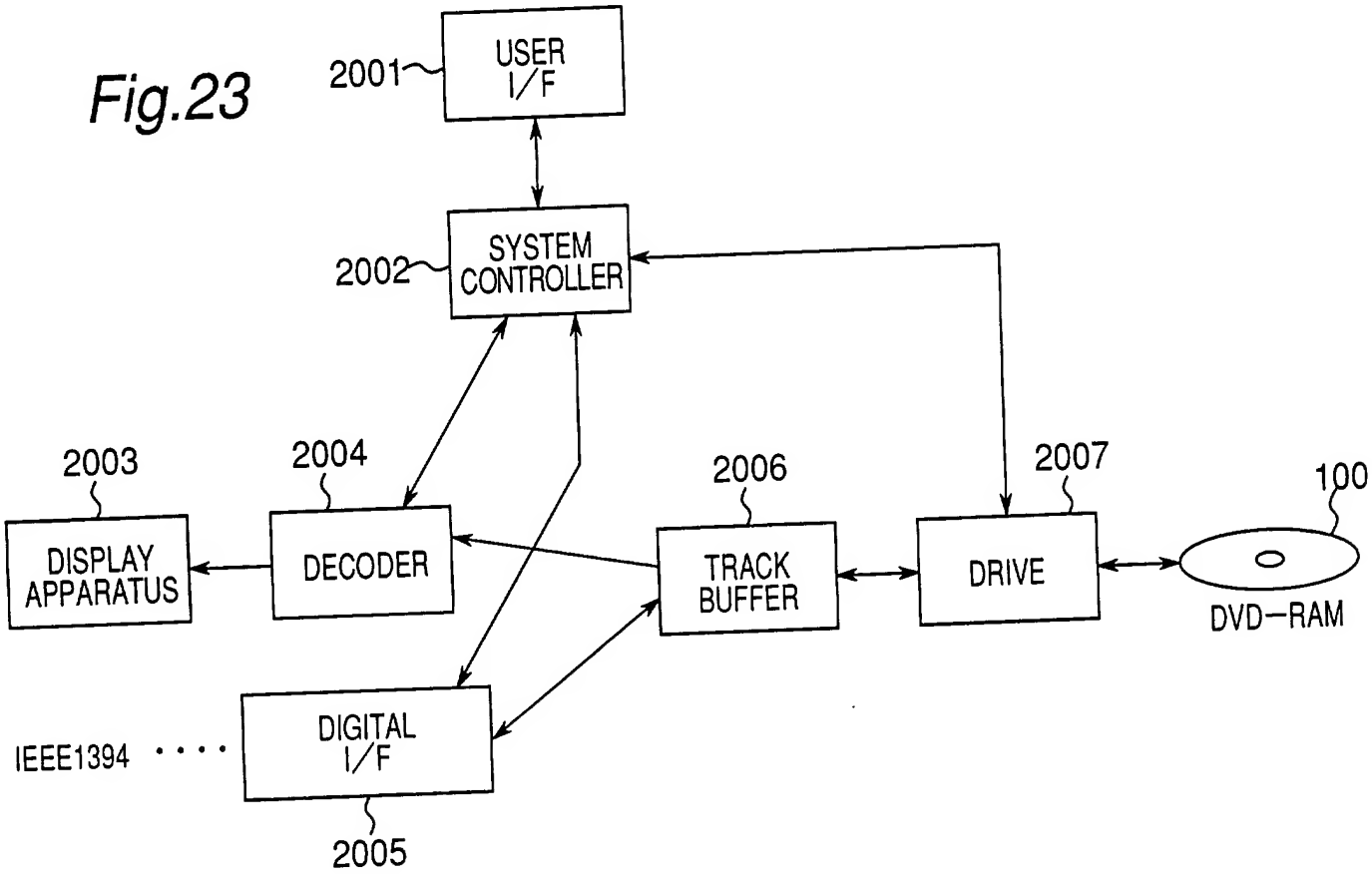

2001
USER I/F
2002
SYSTEM CONTROLLER
2003
DISPLAY APPARATUS
2004
DECODER
2005
DIGITAL I/F
IEEE1394
2006
TRACK BUFFER
2007
DRIVE
100
DVD−RAM

Fig.24

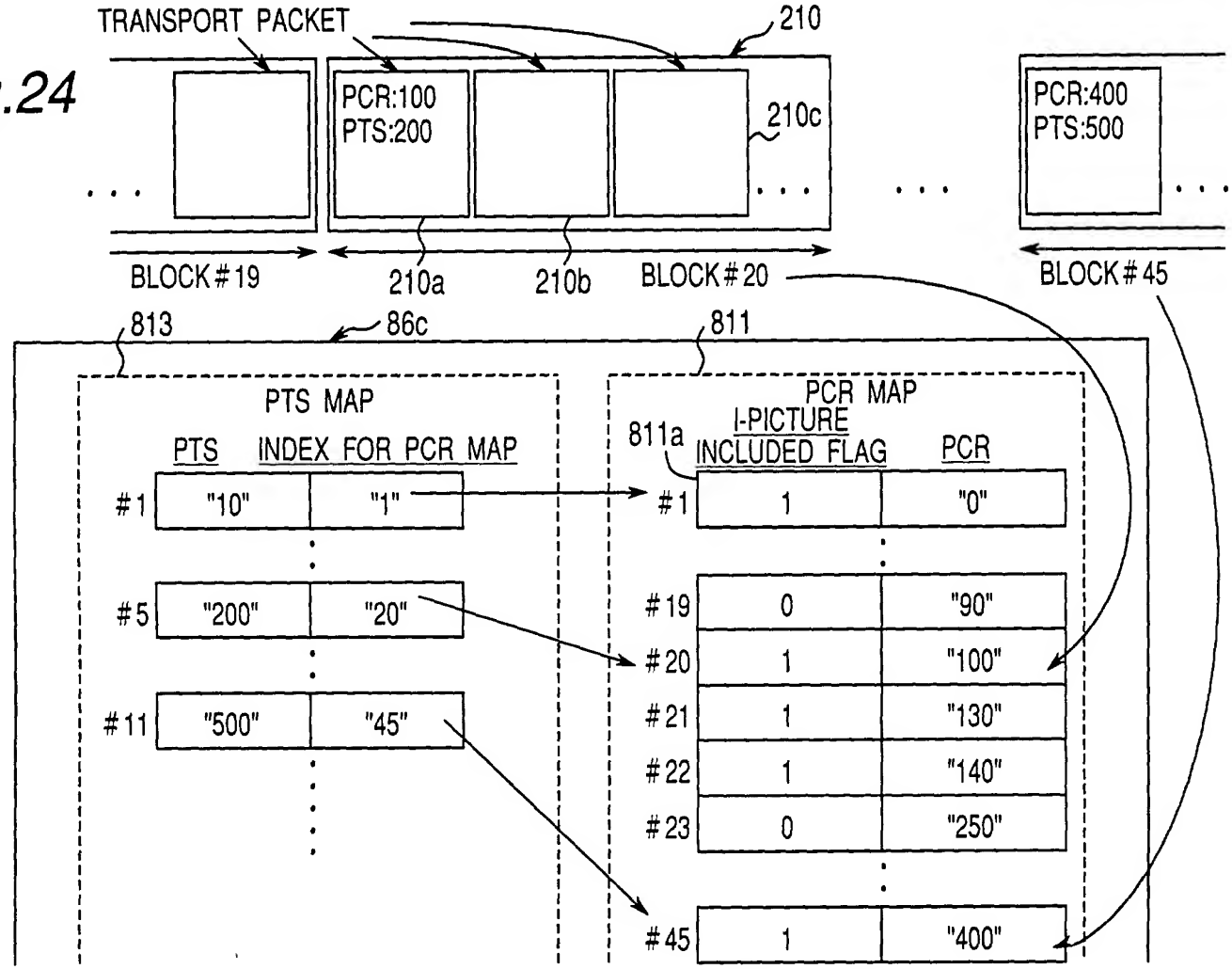

TRANSPORT PACKET
210
PCR:100
PTS:200
210c
PCR:400
PTS:500
BLOCK#19
210a
210b
BLOCK#20
BLOCK#45
813
86c
811
PTS MAP
PTS
INDEX FOR PCR MAP
#1
"10"
"1"
#5
"200"
"20"
#11
"500"
"45"
PCR MAP
811a
I-PICTURE INCLUDED FLAG
PCR
#1
1
"0"
#19
0
"90"
#20
1
"100"
#21
1
"130"
#22
1
"140"
#23
0
"250"
#45
1
"400"

Fig.25

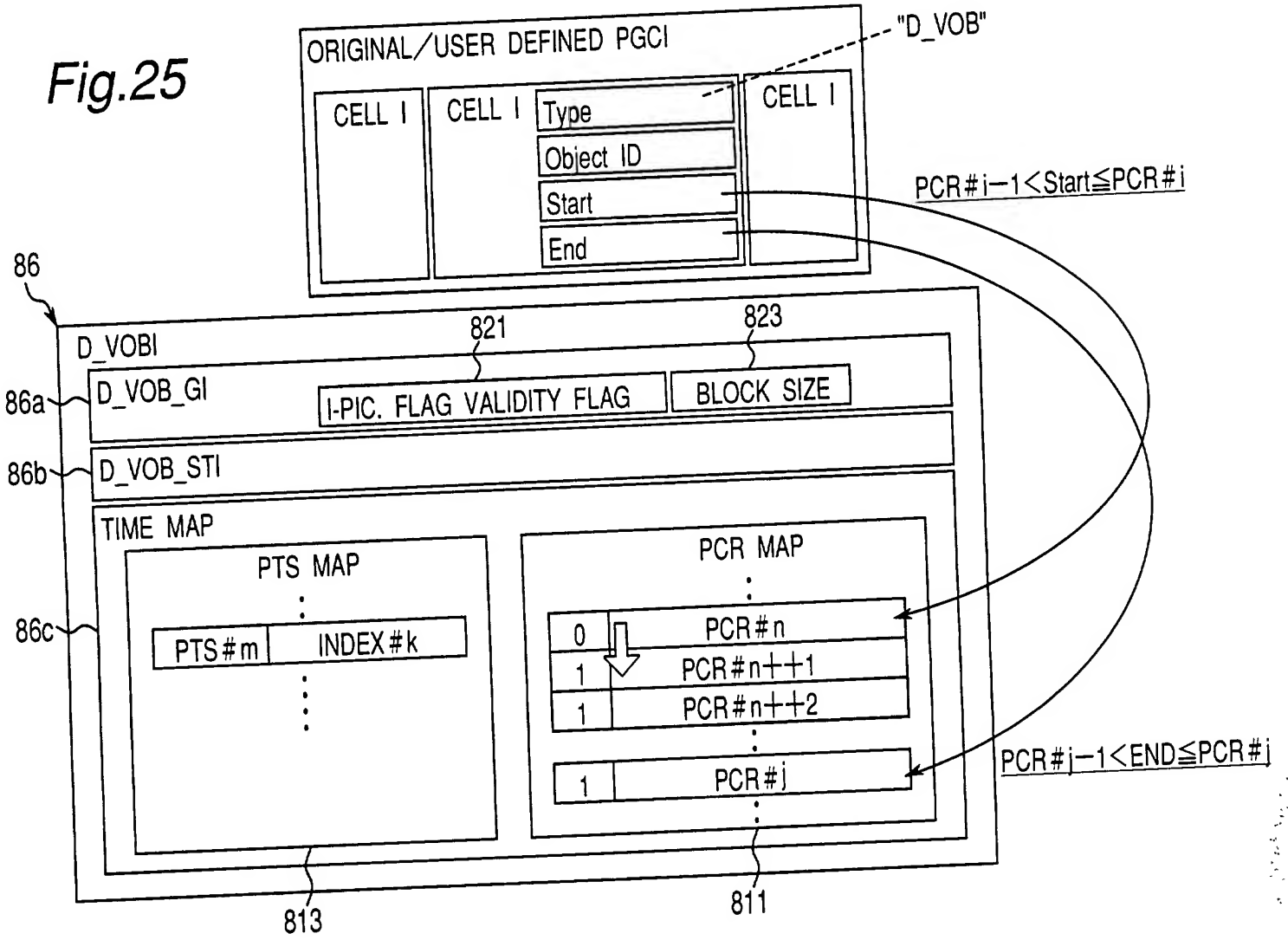

ORIGINAL/USER DEFINED PGCI
"D_VOB"
CELL I
CELL I
Type
Object ID
Start
End
CELL I
PCR#i−1<Start≦PCR#i
86
D_VOBI
821
823
86a
D_VOB_GI
I-PIC. FLAG VALIDITY FLAG
BLOCK SIZE
86b
D_VOB_STI
TIME MAP
PTS MAP
PCR MAP
86c
PTS#m
INDEX#k
0
PCR#n
1
PCR#n++1
1
PCR#n++2
1
PCR#j
PCR#j−1<END≦PCR#j
813
811

Fig.26

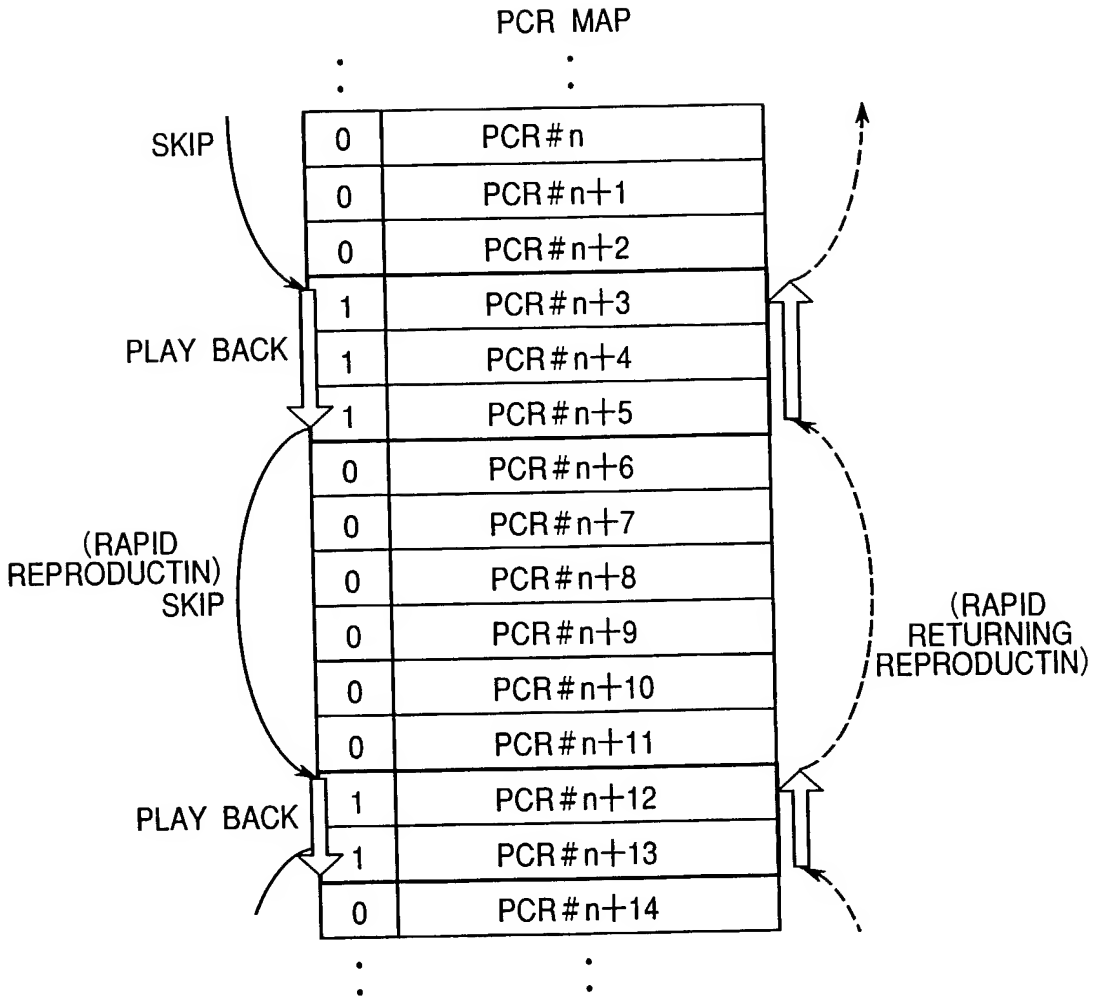

PCR MAP
SKIP
PLAY BACK
(RAPID REPRODUCTIN) SKIP
PLAY BACK
(RAPID RETURNING REPRODUCTIN)
0 PCR#n
0 PCR#n+1
0 PCR#n+2
1 PCR#n+3
1 PCR#n+4
1 PCR#n+5
0 PCR#n+6
0 PCR#n+7
0 PCR#n+8
0 PCR#n+9
0 PCR#n+10
0 PCR#n+11
1 PCR#n+12
1 PCR#n+13
0 PCR#n+14

Fig.27

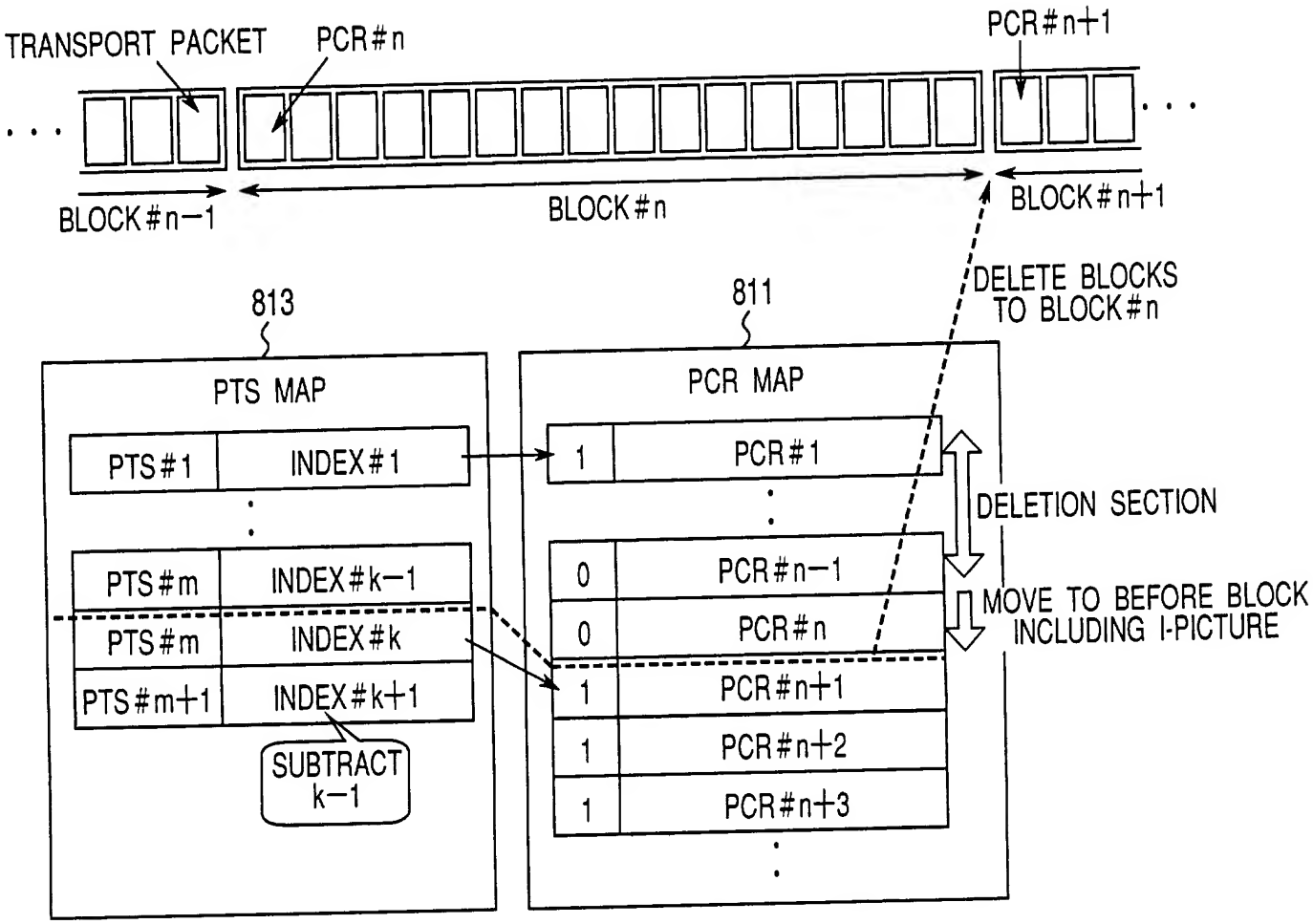

TRANSPORT PACKET
PCR#n
PCR#n+1
BLOCK#n−1
BLOCK#n
BLOCK#n+1
DELETE BLOCKS TO BLOCK#n
813
811
PTS MAP
PCR MAP
PTS#1
INDEX#1
PTS#m
INDEX#k−1
PTS#m
INDEX#k
PTS#m+1
INDEX#k+1
SUBTRACT k−1
1
PCR#1
0
PCR#n−1
0
PCR#n
1
PCR#n+1
1
PCR#n+2
1
PCR#n+3
DELETION SECTION
MOVE TO BEFORE BLOCK INCLUDING I-PICTURE

Fig.28

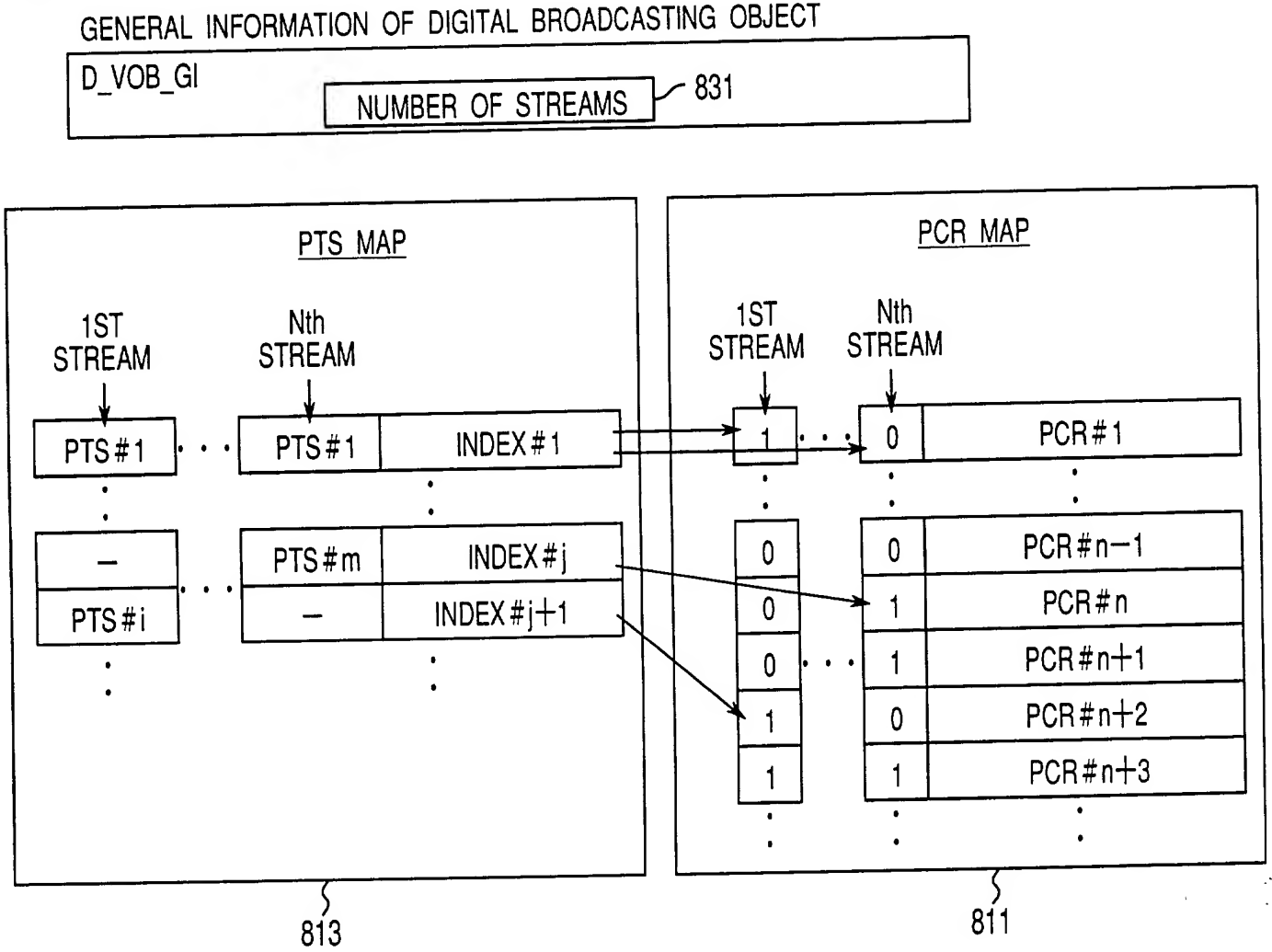

GENERAL INFORMATION OF DIGITAL BROADCASTING OBJECT
D_VOB_GI
NUMBER OF STREAMS
831
PTS MAP
1ST STREAM
Nth STREAM
PTS#1
PTS#1
INDEX#1
–
PTS#i
PTS#m
INDEX#j
–
INDEX#j+1
813
PCR MAP
1ST STREAM
Nth STREAM
1
0
PCR#1
0
0
0
1
1
0
1
0
1
PCR#n−1
PCR#n
PCR#n+1
PCR#n+2
PCR#n+3
811

Fig.29

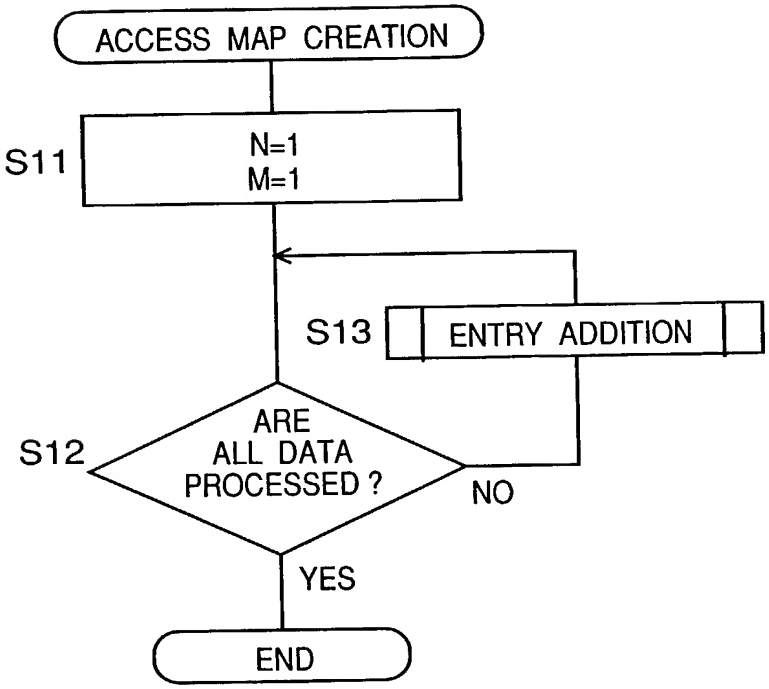

ACCESS MAP CREATION
S11
N=1
M=1
S13
ENTRY ADDITION
S12
ARE
ALL DATA
PROCESSED ?
NO
YES
END

Fig.30

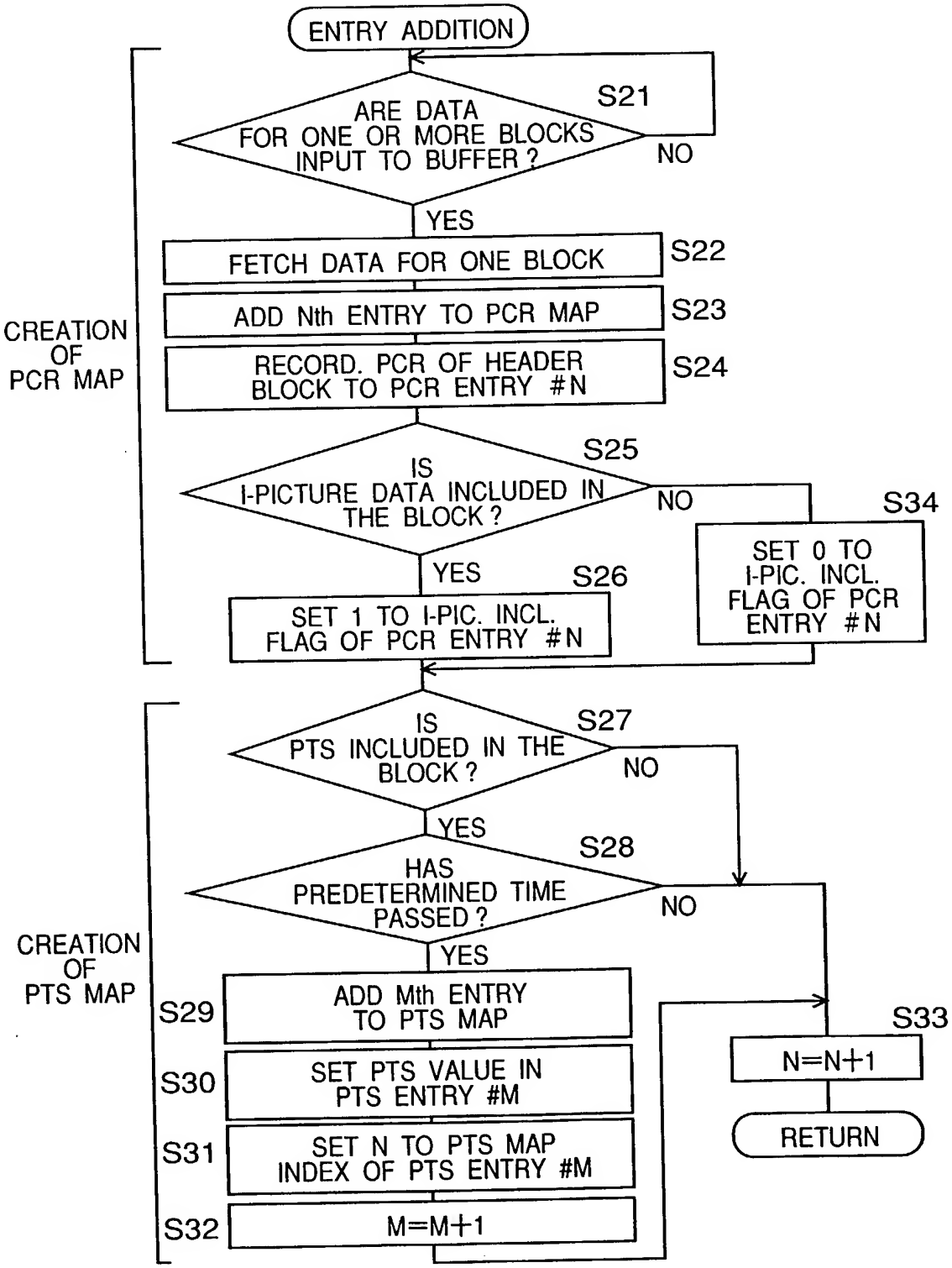

ENTRY ADDITION
S21
ARE DATA FOR ONE OR MORE BLOCKS INPUT TO BUFFER ?
NO
YES
FETCH DATA FOR ONE BLOCK
S22
ADD Nth ENTRY TO PCR MAP
S23
RECORD. PCR OF HEADER BLOCK TO PCR ENTRY #N
S24
CREATION OF PCR MAP
S25
IS I-PICTURE DATA INCLUDED IN THE BLOCK ?
NO
S34
SET 0 TO I-PIC. INCL. FLAG OF PCR ENTRY #N
YES
S26
SET 1 TO I-PIC. INCL. FLAG OF PCR ENTRY #N
S27
IS PTS INCLUDED IN THE BLOCK ?
NO
YES
S28
HAS PREDETERMINED TIME PASSED ?
NO
YES
CREATION OF PTS MAP
S29
ADD Mth ENTRY TO PTS MAP
S30
SET PTS VALUE IN PTS ENTRY #M
S31
SET N TO PTS MAP INDEX OF PTS ENTRY #M
S32
M=M+1
S33
N=N+1
RETURN

Fig.31

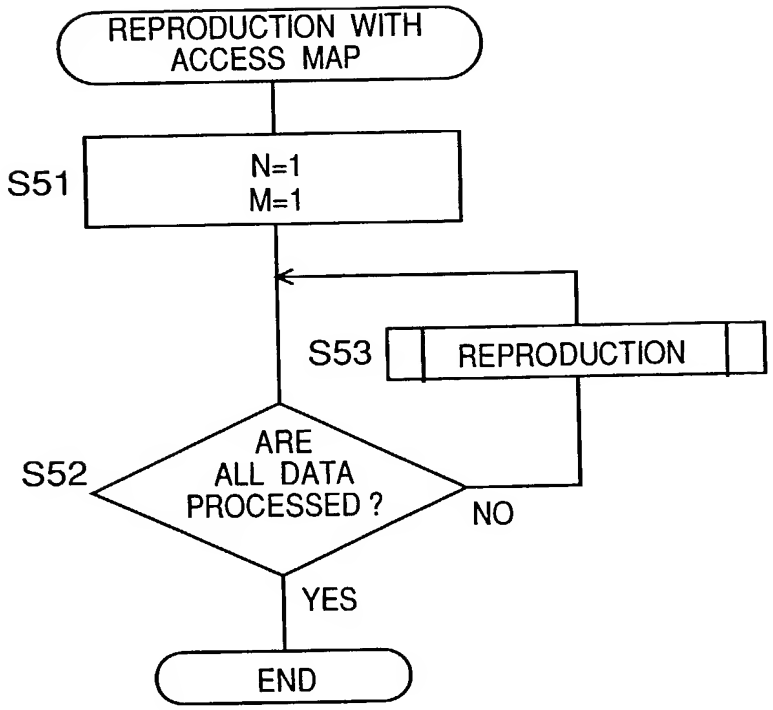

REPRODUCTION WITH ACCESS MAP
S51
N=1
M=1
S53
REPRODUCTION
S52
ARE ALL DATA PROCESSED ?
NO
YES
END

Fig.32

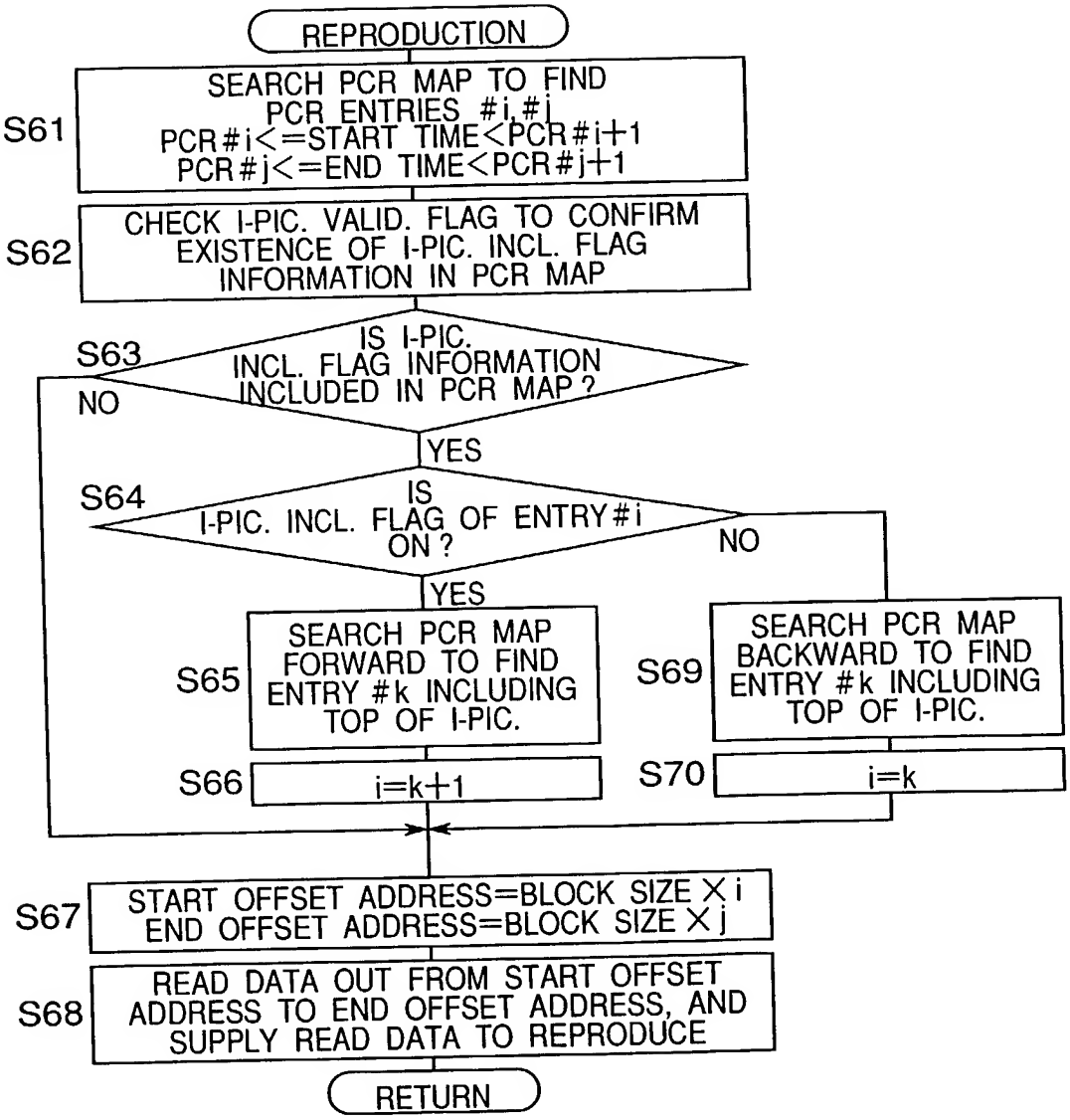

REPRODUCTION
S61
SEARCH PCR MAP TO FIND PCR ENTRIES #i, #j
PCR#i<=START TIME<PCR#i+1
PCR#j<=END TIME<PCR#j+1
S62
CHECK I-PIC. VALID. FLAG TO CONFIRM EXISTENCE OF I-PIC. INCL. FLAG INFORMATION IN PCR MAP
S63
IS I-PIC. INCL. FLAG INFORMATION INCLUDED IN PCR MAP ?
NO
YES
S64
IS I-PIC. INCL. FLAG OF ENTRY#i ON ?
NO
YES
S65
SEARCH PCR MAP FORWARD TO FIND ENTRY #k INCLUDING TOP OF I-PIC.
S66
i=k+1
S69
SEARCH PCR MAP BACKWARD TO FIND ENTRY #k INCLUDING TOP OF I-PIC.
S70
i=k
S67
START OFFSET ADDRESS=BLOCK SIZE X i
END OFFSET ADDRESS=BLOCK SIZE X j
S68
READ DATA OUT FROM START OFFSET ADDRESS TO END OFFSET ADDRESS, AND SUPPLY READ DATA TO REPRODUCE
RETURN

Fig.33A

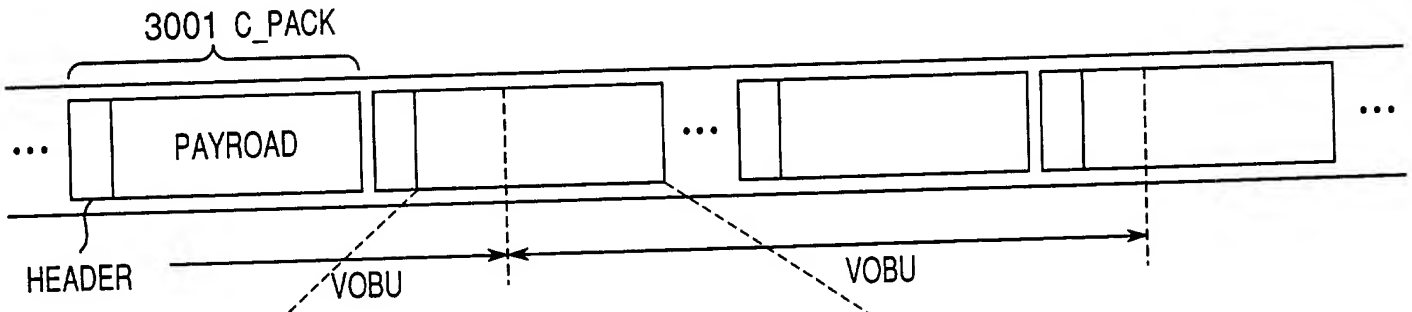


Fig.33B

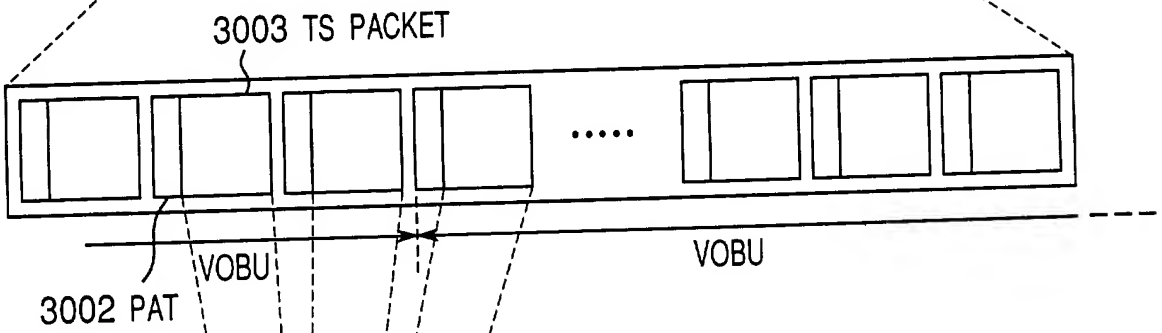


Fig.33C

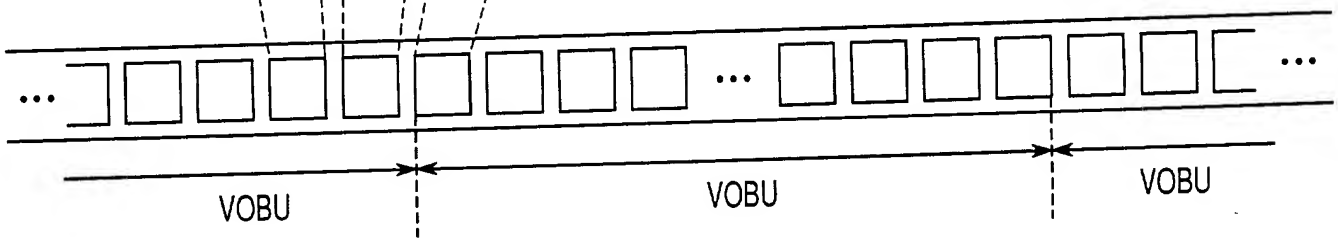


Fig.34

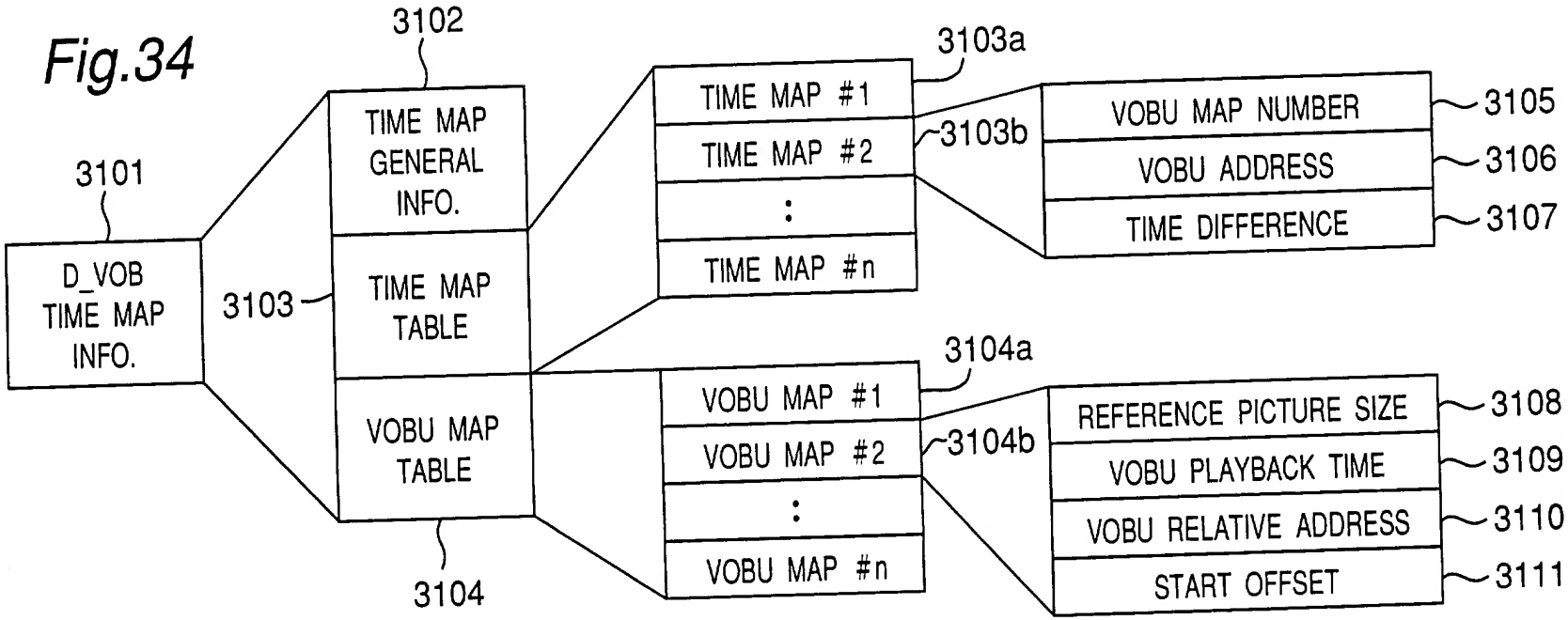

3102
3103a
3101
TIME MAP GENERAL INFO.
TIME MAP #1
TIME MAP #2
:
TIME MAP #n
3103b
VOBU MAP NUMBER
VOBU ADDRESS
TIME DIFFERENCE
3105
3106
3107
D_VOB TIME MAP INFO.
3103
TIME MAP TABLE
3104a
VOBU MAP #1
VOBU MAP #2
:
VOBU MAP #n
3104b
REFERENCE PICTURE SIZE
VOBU PLAYBACK TIME
VOBU RELATIVE ADDRESS
START OFFSET
3108
3109
3110
3111
VOBU MAP TABLE
3104

Fig.35

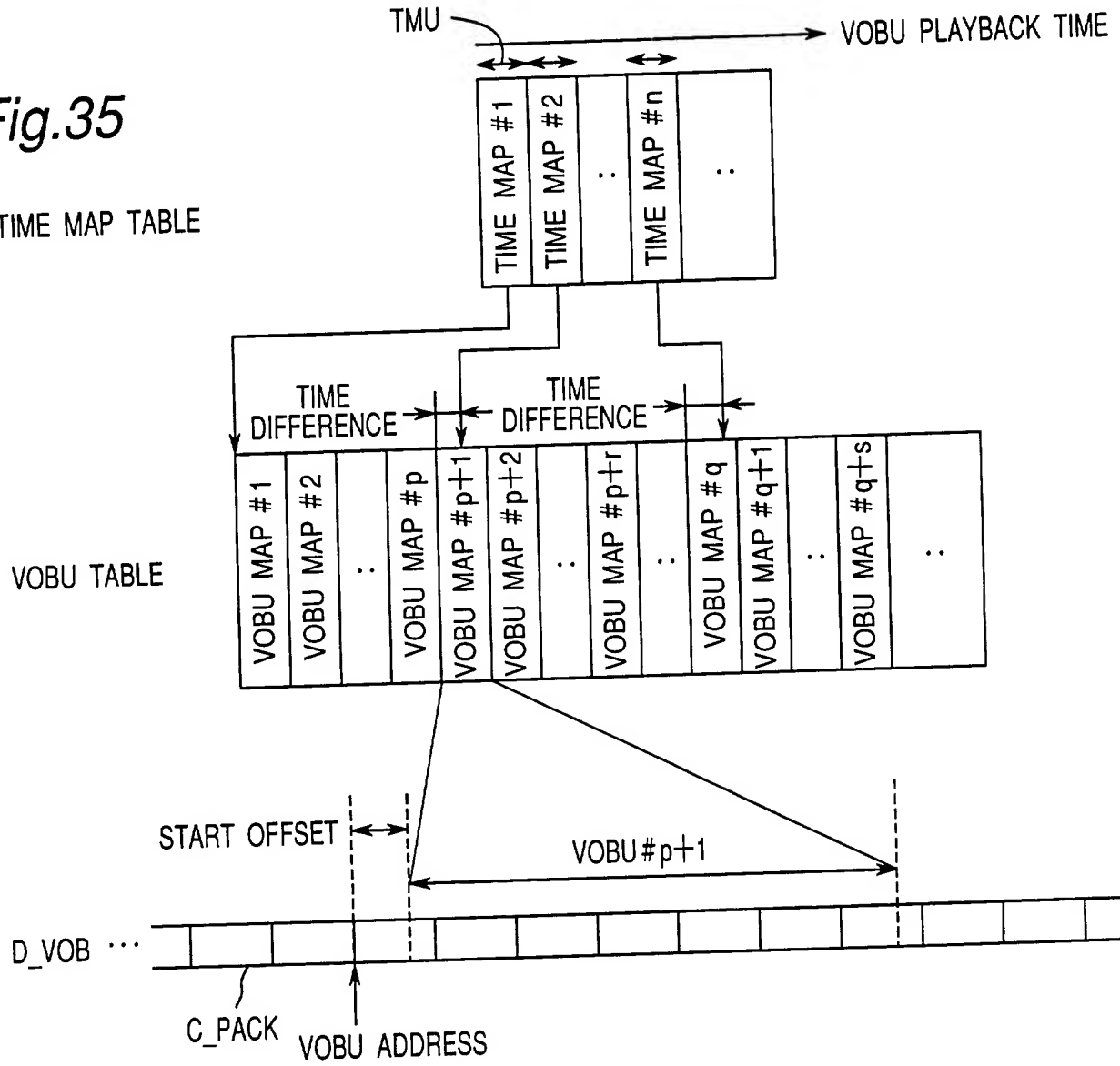

TMU
VOBU PLAYBACK TIME
TIME MAP TABLE
TIME MAP #1
TIME MAP #2
TIME MAP #n
TIME DIFFERENCE
TIME DIFFERENCE
VOBU TABLE
VOBU MAP #1
VOBU MAP #2
VOBU MAP #p
VOBU MAP #p+1
VOBU MAP #p+2
VOBU MAP #p+r
VOBU MAP #q
VOBU MAP #q+1
VOBU MAP #q+s
START OFFSET
VOBU#p+1
D_VOB
C_PACK
VOBU ADDRESS

Fig.36

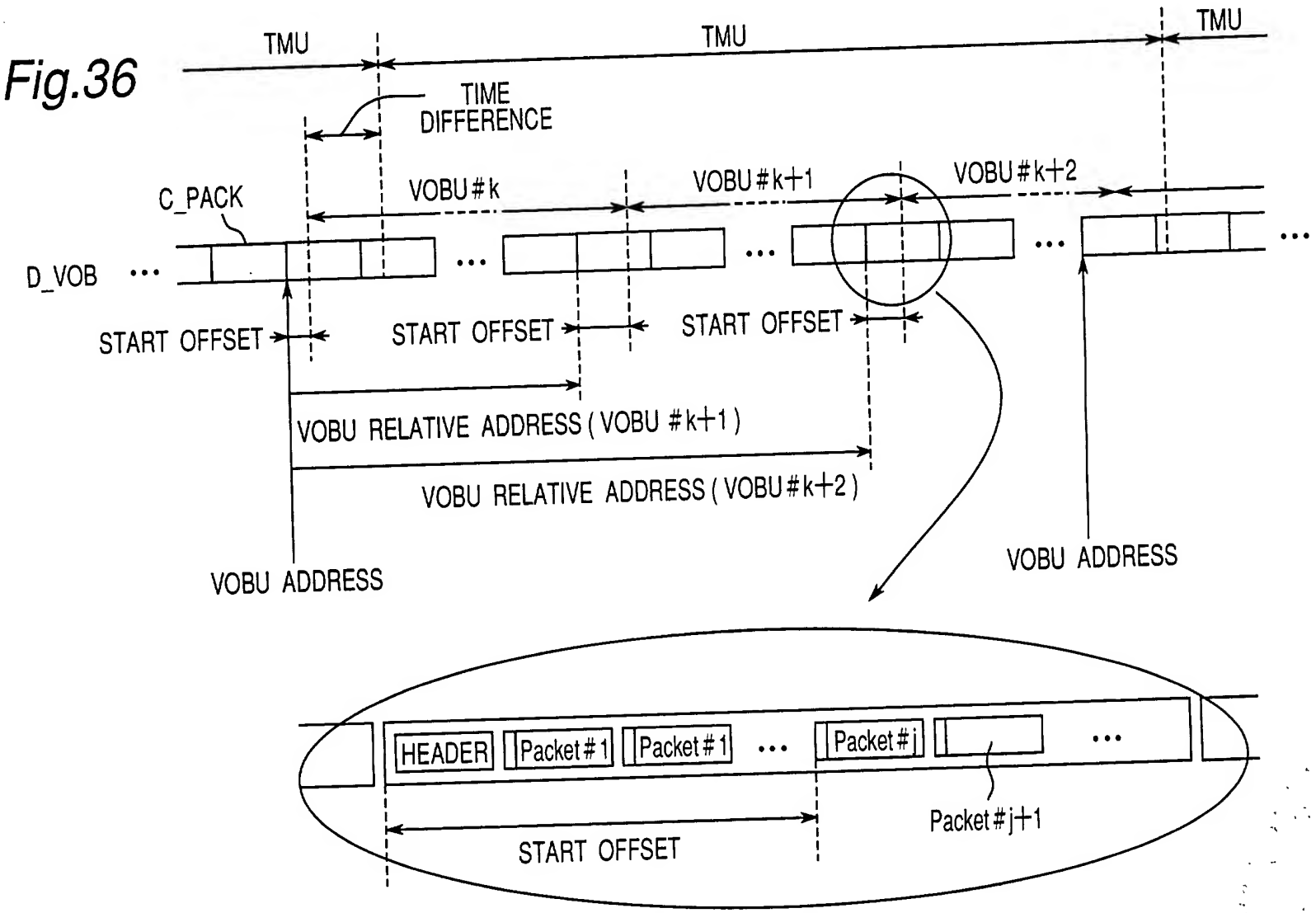

TMU
TMU
TMU
TIME DIFFERENCE
C_PACK
VOBU#k
VOBU#k+1
VOBU#k+2
D_VOB
START OFFSET
START OFFSET
START OFFSET
VOBU RELATIVE ADDRESS (VOBU #k+1)
VOBU RELATIVE ADDRESS (VOBU#k+2)
VOBU ADDRESS
VOBU ADDRESS
HEADER
Packet#1
Packet#1
Packet#j
Packet#j+1
START OFFSET

Fig.37A

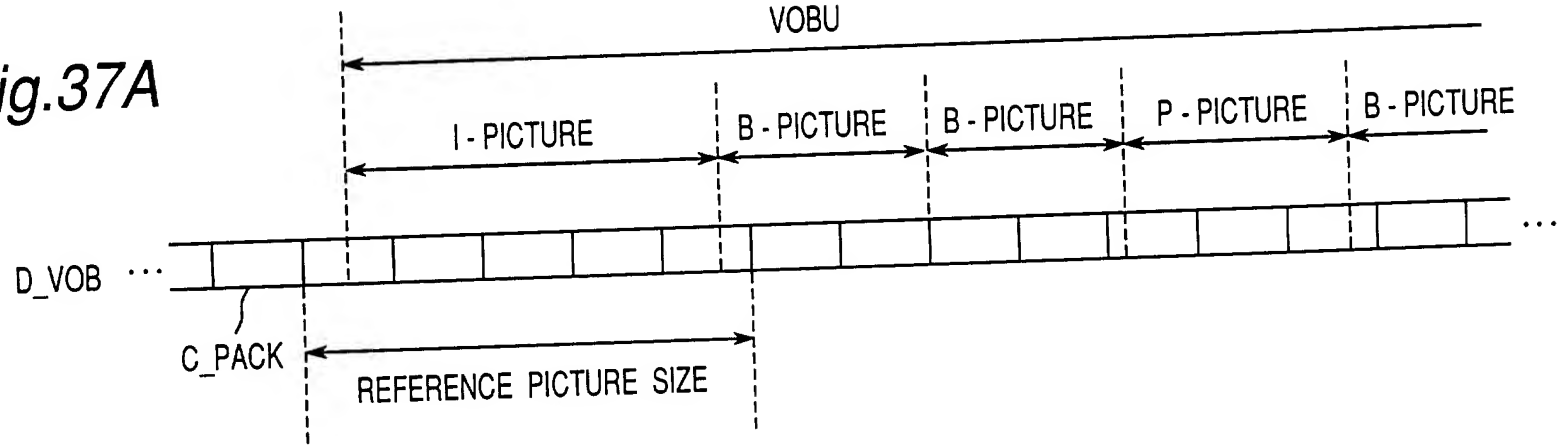


Fig.37B

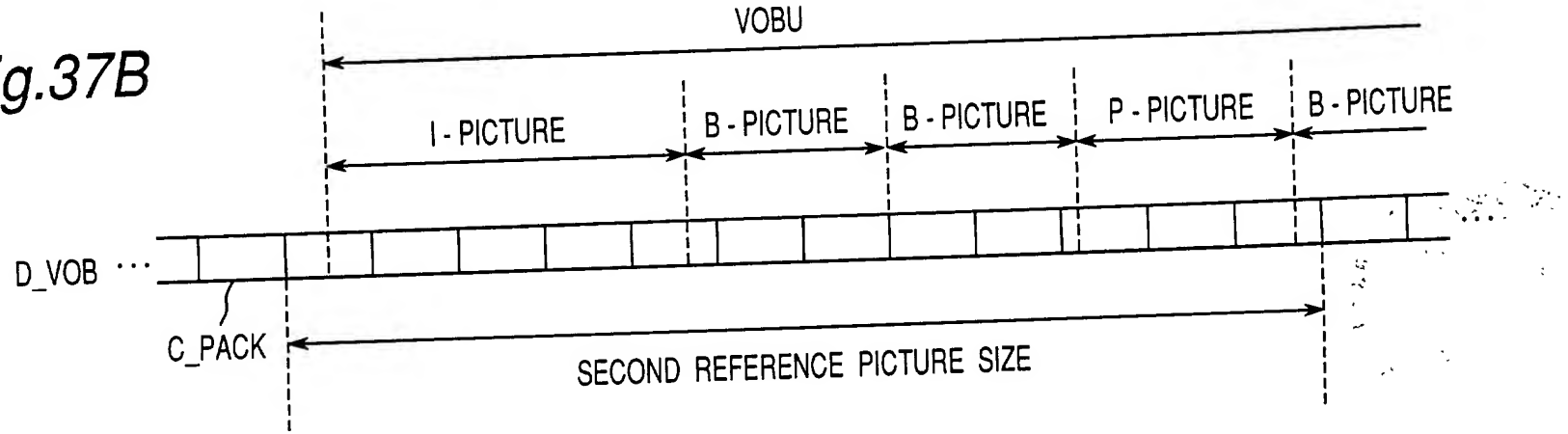


Fig.38

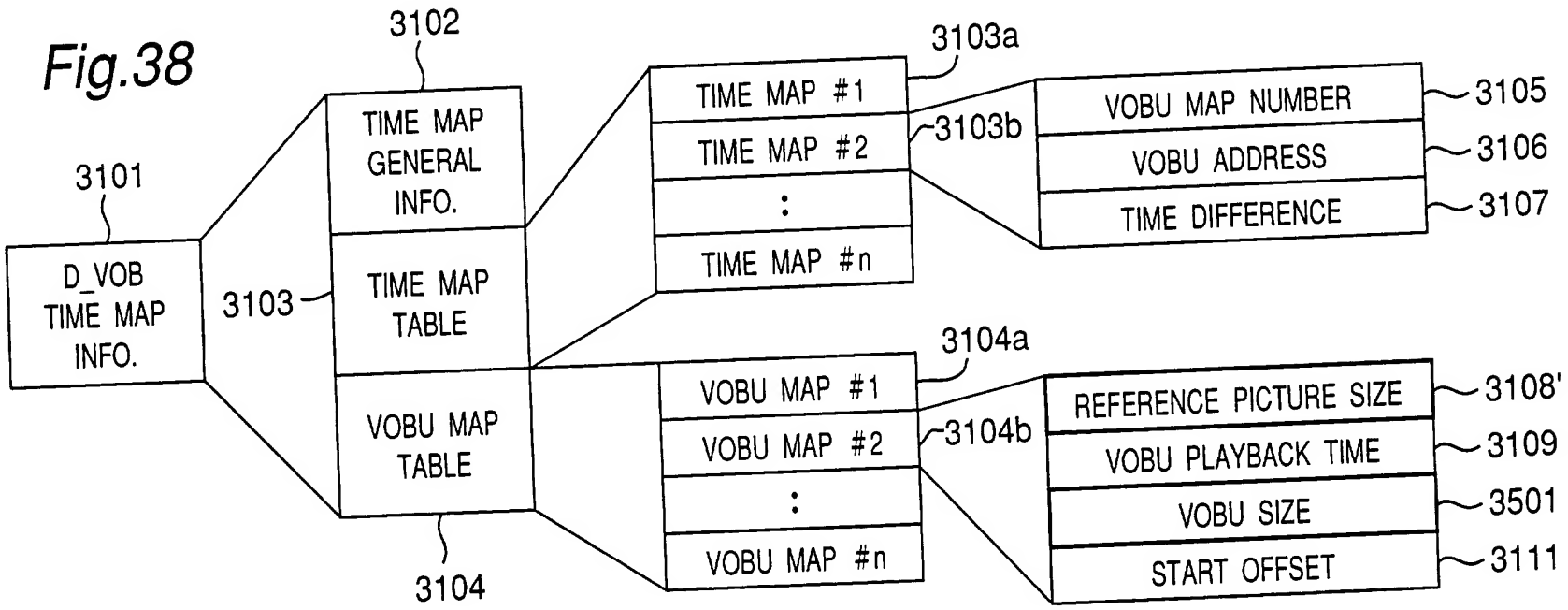

3102
3103a
3101
D_VOB TIME MAP INFO.
3103
TIME MAP GENERAL INFO.
TIME MAP TABLE
VOBU MAP TABLE
3104
TIME MAP #1
TIME MAP #2
:
TIME MAP #n
3103b
VOBU MAP NUMBER
VOBU ADDRESS
TIME DIFFERENCE
3105
3106
3107
3104a
VOBU MAP #1
VOBU MAP #2
:
VOBU MAP #n
3104b
REFERENCE PICTURE SIZE
VOBU PLAYBACK TIME
VOBU SIZE
START OFFSET
3108'
3109
3501
3111

Fig.39

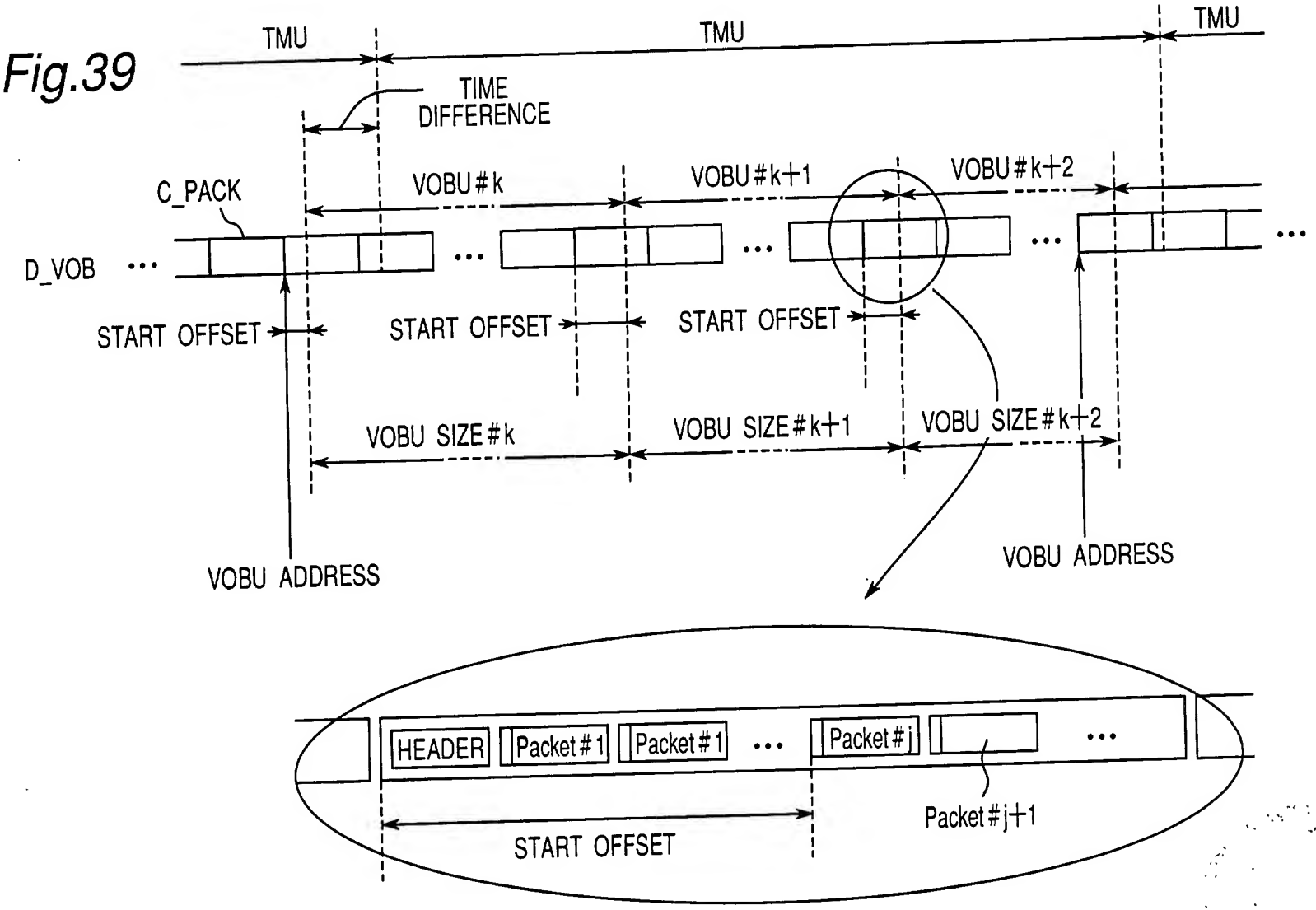

TMU
TMU
TMU
TIME DIFFERENCE
C_PACK
VOBU#k
VOBU#k+1
VOBU#k+2
D_VOB
START OFFSET
START OFFSET
START OFFSET
VOBU SIZE#k
VOBU SIZE#k+1
VOBU SIZE#k+2
VOBU ADDRESS
VOBU ADDRESS
HEADER
Packet#1
Packet#1
Packet#j
Packet#j+1
START OFFSET

Fig.40

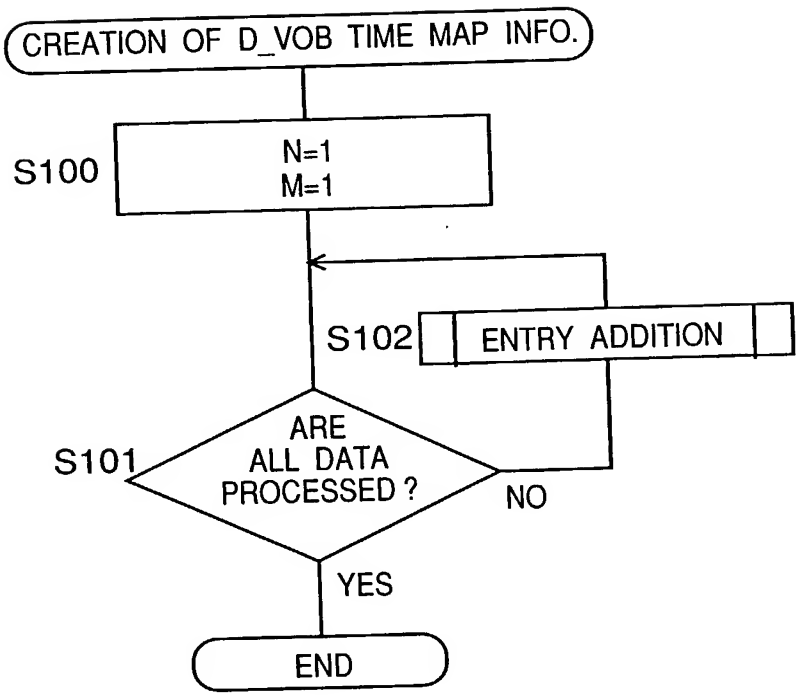

CREATION OF D_VOB TIME MAP INFO.
S100
N=1
M=1
S102
ENTRY ADDITION
S101
ARE
ALL DATA
PROCESSED ?
NO
YES
END

Fig.41

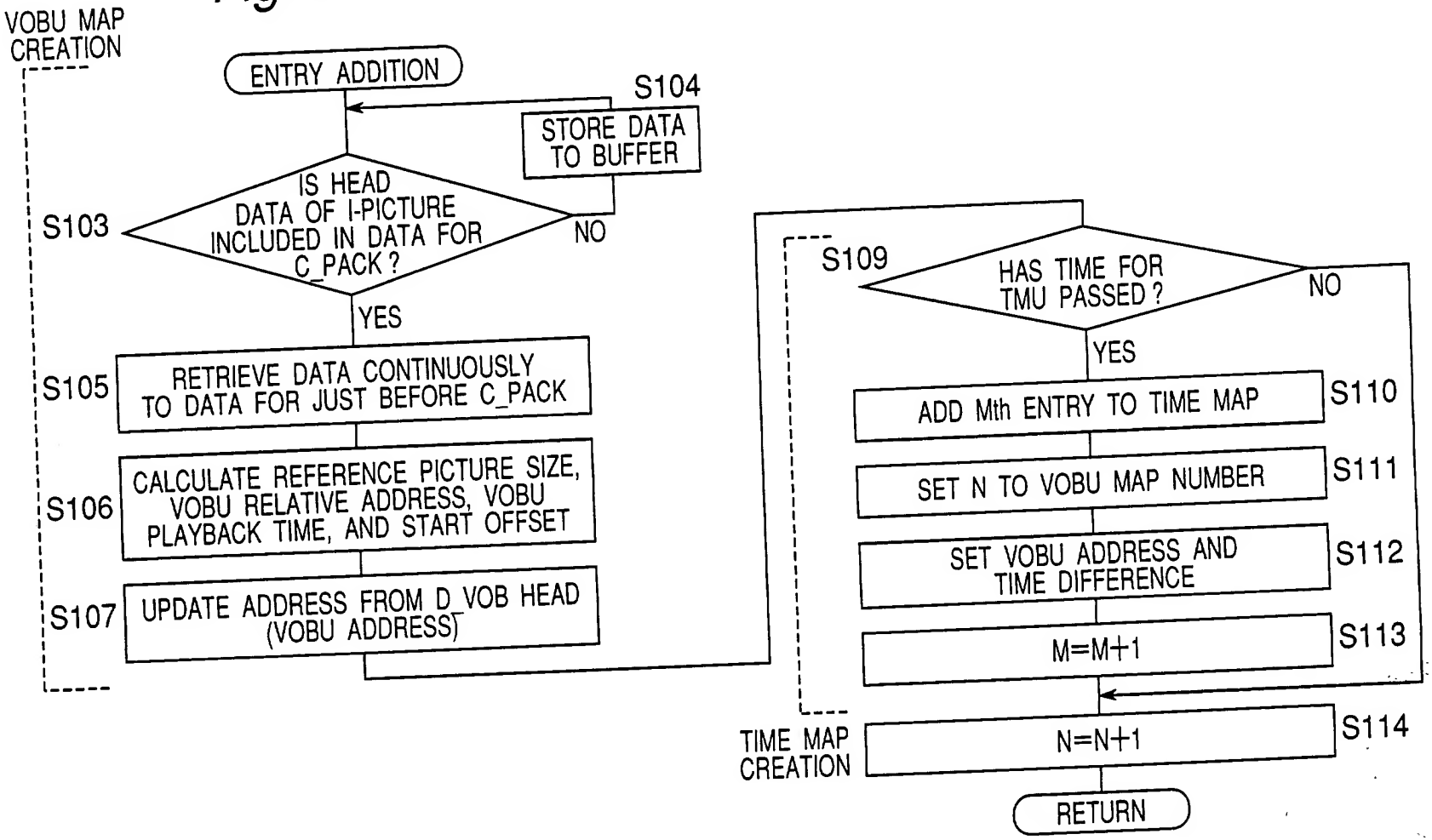

VOBU MAP CREATION
ENTRY ADDITION
S104
STORE DATA TO BUFFER
S103
IS HEAD DATA OF I-PICTURE INCLUDED IN DATA FOR C_PACK ?
NO
YES
S105
RETRIEVE DATA CONTINUOUSLY TO DATA FOR JUST BEFORE C_PACK
S106
CALCULATE REFERENCE PICTURE SIZE, VOBU RELATIVE ADDRESS, VOBU PLAYBACK TIME, AND START OFFSET
S107
UPDATE ADDRESS FROM D_VOB HEAD (VOBU ADDRESS)
S109
HAS TIME FOR TMU PASSED ?
NO
YES
S110
ADD Mth ENTRY TO TIME MAP
S111
SET N TO VOBU MAP NUMBER
S112
SET VOBU ADDRESS AND TIME DIFFERENCE
S113
M=M+1
S114
N=N+1
TIME MAP CREATION
RETURN

Fig.42

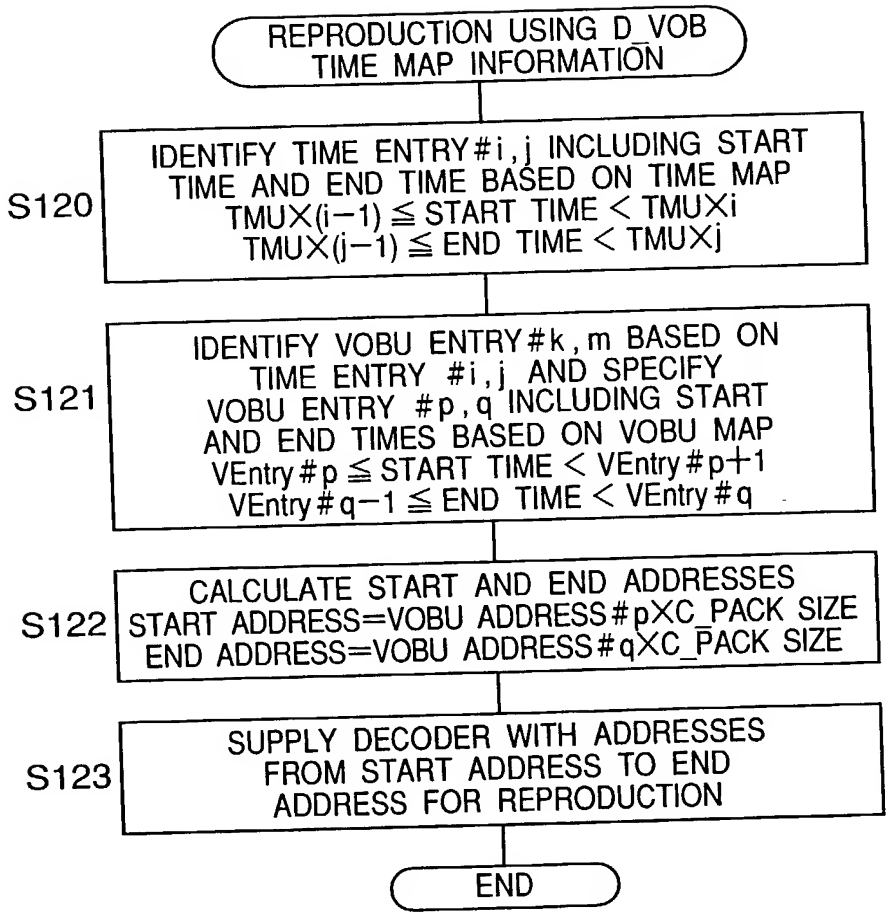

REPRODUCTION USING D_VOB TIME MAP INFORMATION
S120
IDENTIFY TIME ENTRY#i,j INCLUDING START TIME AND END TIME BASED ON TIME MAP
TMUX(i−1) ≦ START TIME < TMUXi
TMUX(j−1) ≦ END TIME < TMUXj
S121
IDENTIFY VOBU ENTRY#k,m BASED ON TIME ENTRY #i,j AND SPECIFY VOBU ENTRY #p,q INCLUDING START AND END TIMES BASED ON VOBU MAP
VEntry#p ≦ START TIME < VEntry#p+1
VEntry#q−1 ≦ END TIME < VEntry#q
S122
CALCULATE START AND END ADDRESSES
START ADDRESS=VOBU ADDRESS#pXC_PACK SIZE
END ADDRESS=VOBU ADDRESS#qXC_PACK SIZE
S123
SUPPLY DECODER WITH ADDRESSES FROM START ADDRESS TO END ADDRESS FOR REPRODUCTION
END

Fig.43A

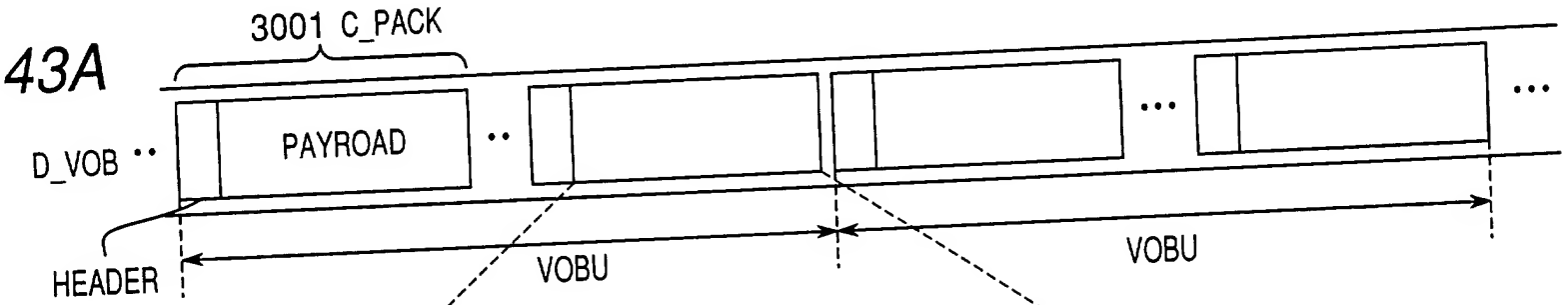


Fig.43B

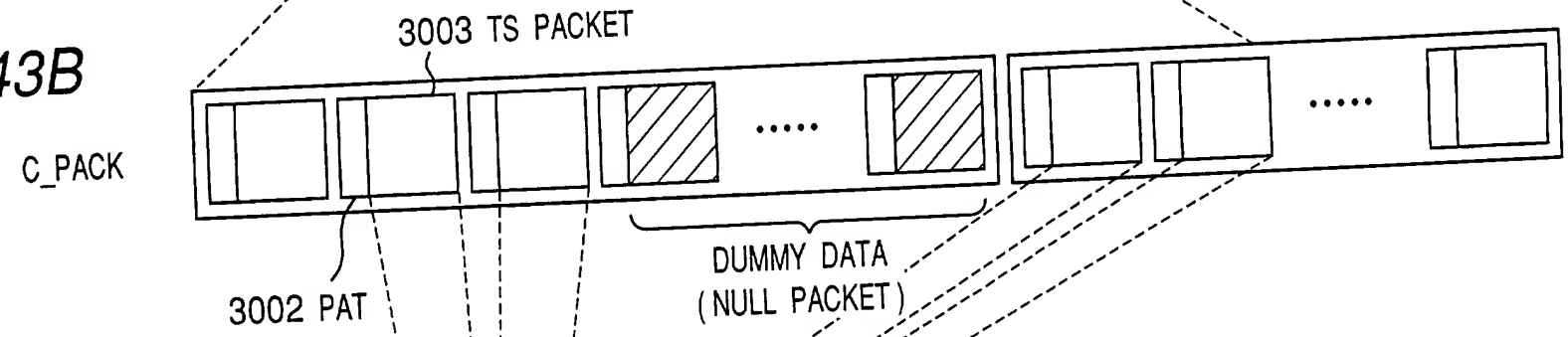


Fig.43C

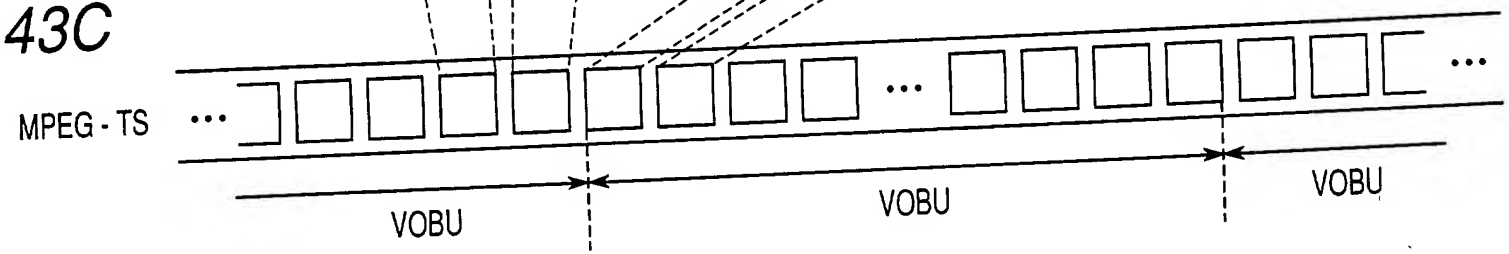


Fig.44A

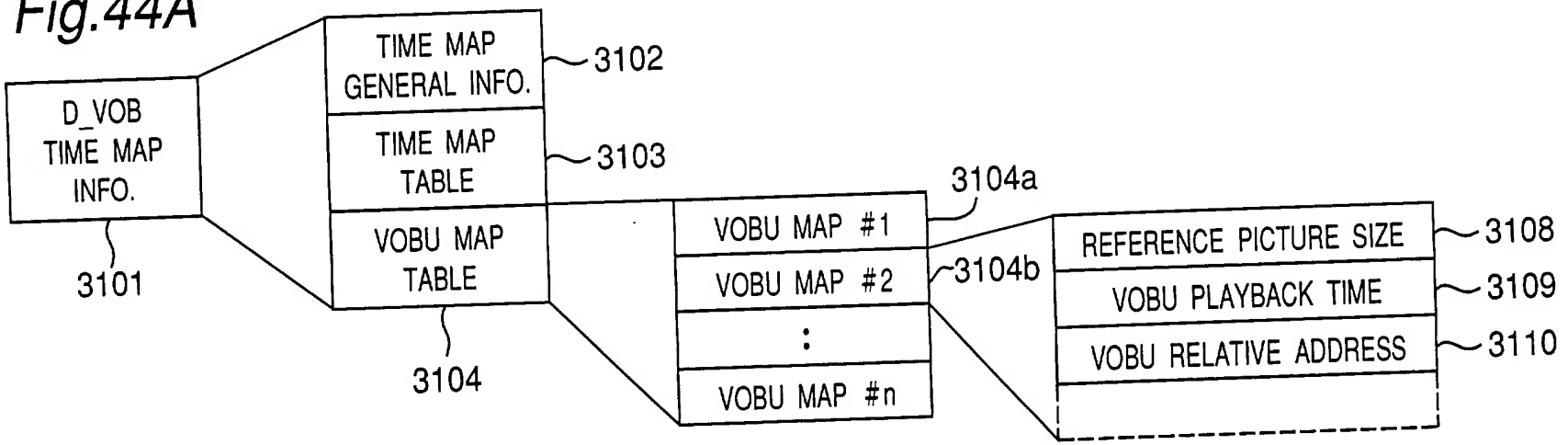


Fig.44B

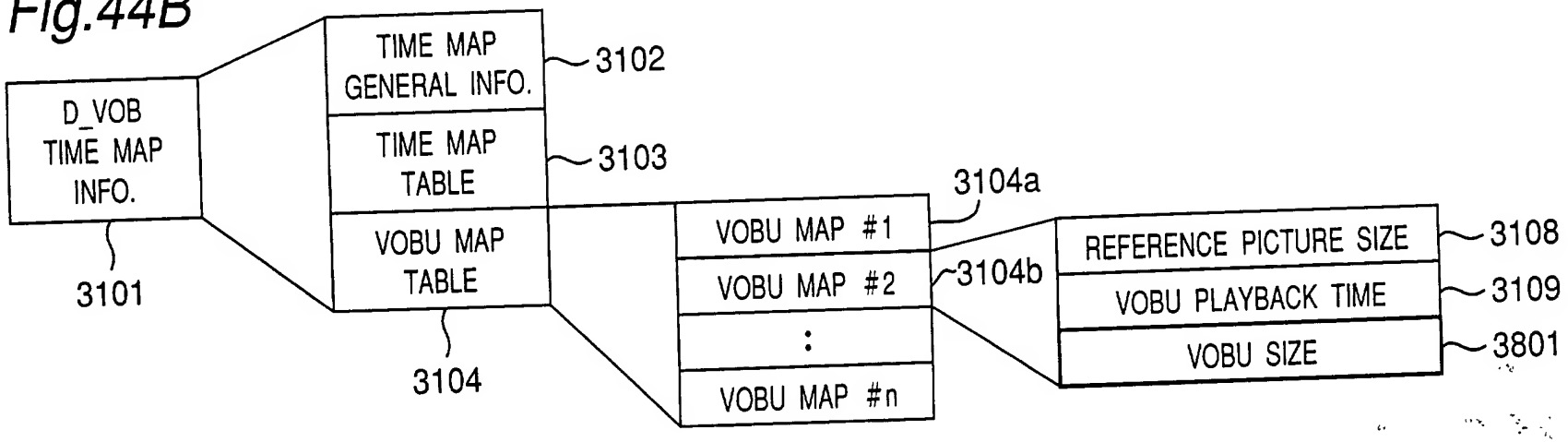


Fig.45A

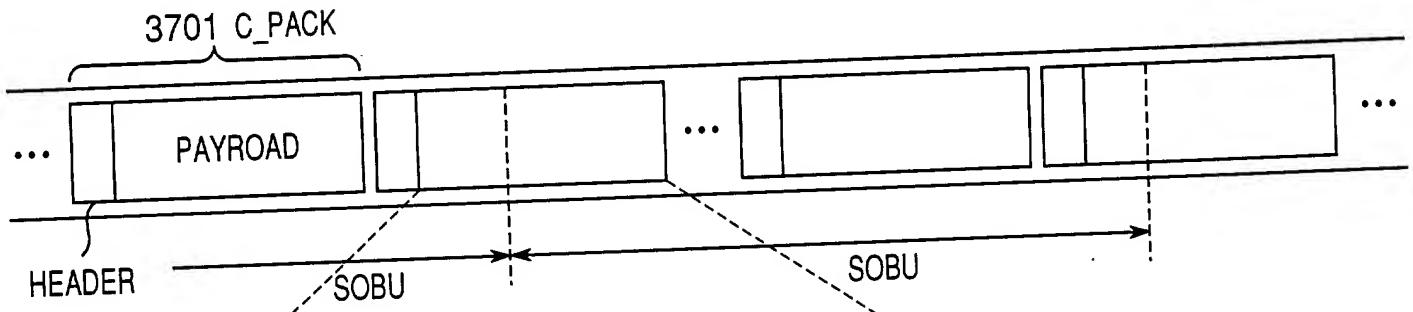


Fig.45B

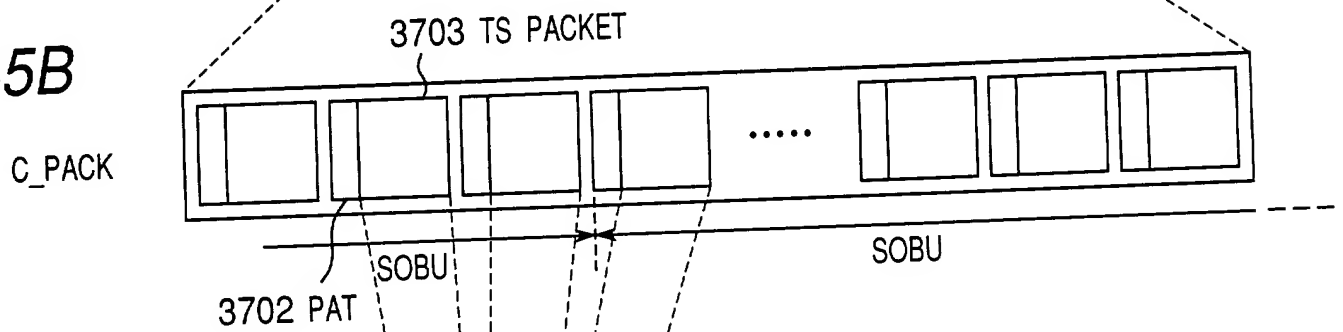


Fig.45C

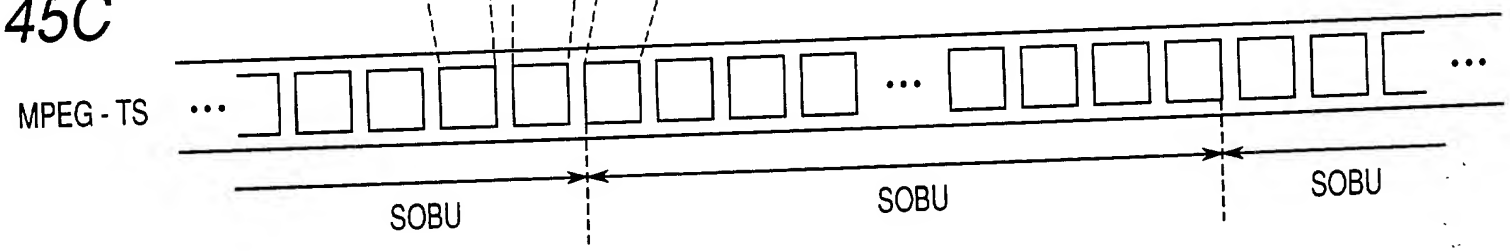


Fig.46

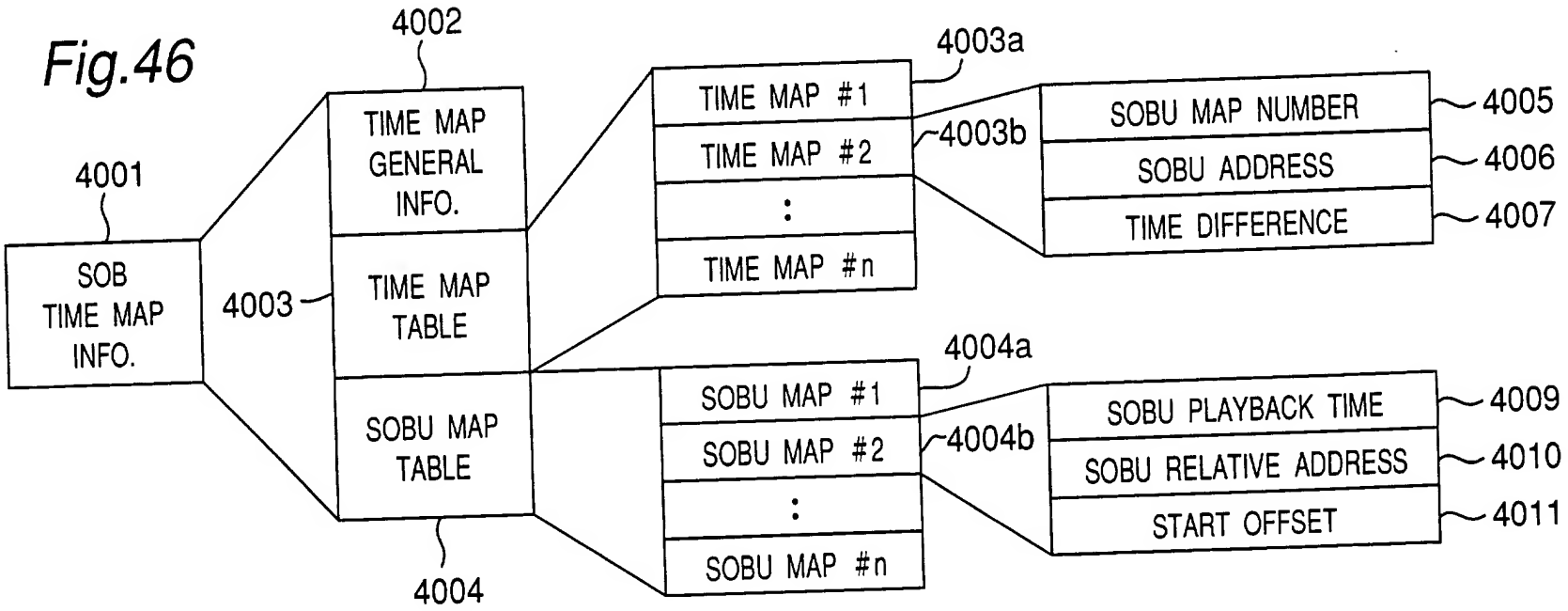
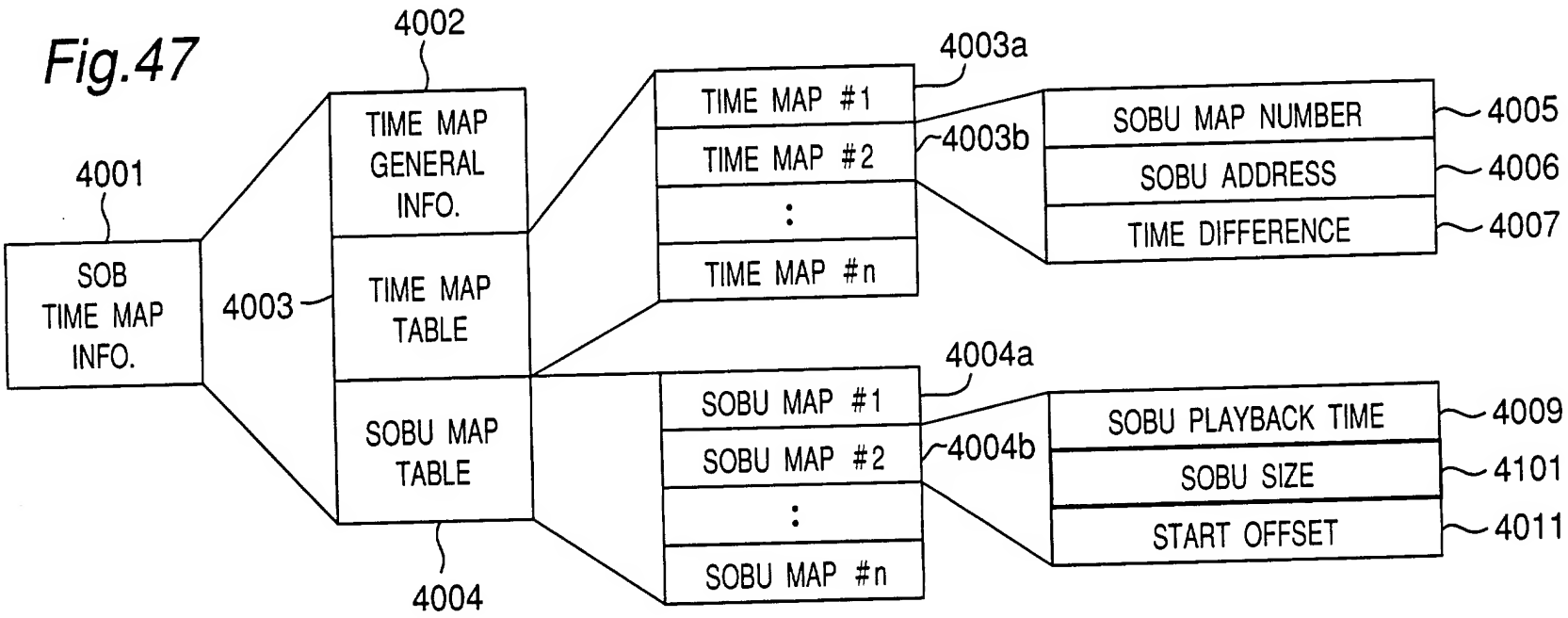

4002
4003a
4001
TIME MAP GENERAL INFO.
TIME MAP #1
TIME MAP #2
:
TIME MAP #n
4003b
SOBU MAP NUMBER
SOBU ADDRESS
TIME DIFFERENCE
4005
4006
4007
SOB TIME MAP INFO.
4003
TIME MAP TABLE
4004a
SOBU MAP #1
SOBU MAP #2
:
SOBU MAP #n
4004b
SOBU PLAYBACK TIME
SOBU RELATIVE ADDRESS
START OFFSET
4009
4010
4011
SOBU MAP TABLE
4004

Fig.47


4001
SOB
TIME MAP
INFO.
4002
TIME MAP
GENERAL
INFO.
4003
TIME MAP
TABLE
SOBU MAP
TABLE
4004
4003a
TIME MAP #1
TIME MAP #2
:
TIME MAP #n
4003b
SOBU MAP NUMBER
SOBU ADDRESS
TIME DIFFERENCE
4005
4006
4007
4004a
SOBU MAP #1
SOBU MAP #2
:
SOBU MAP #n
4004b
SOBU PLAYBACK TIME
SOBU SIZE
START OFFSET
4009
4101
4011